Technical Copy
TECHNOLOGY DEPT.

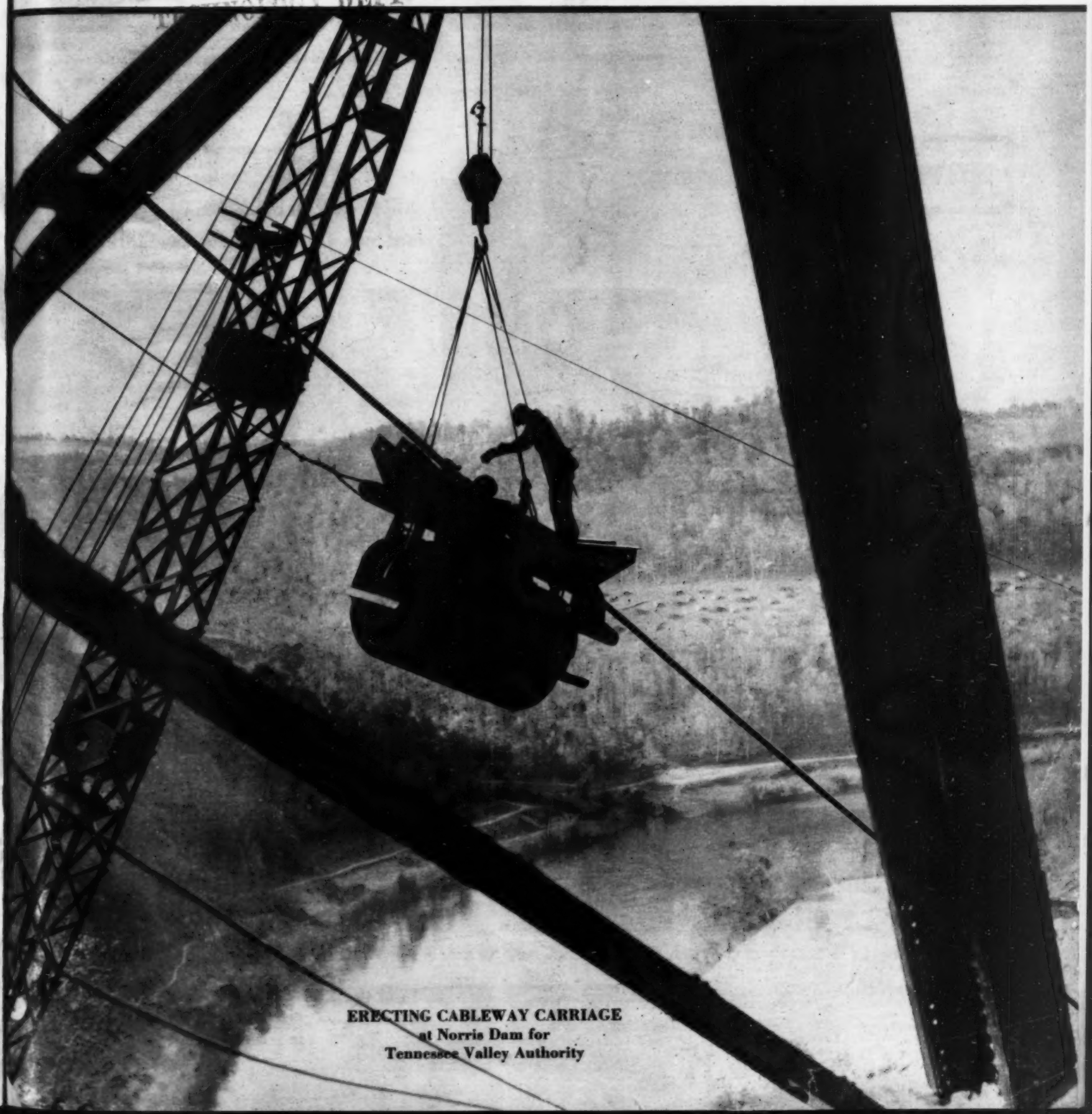
Construction Methods

PUBLIC LIBRARY
NOV 1 7 1934
DETROIT

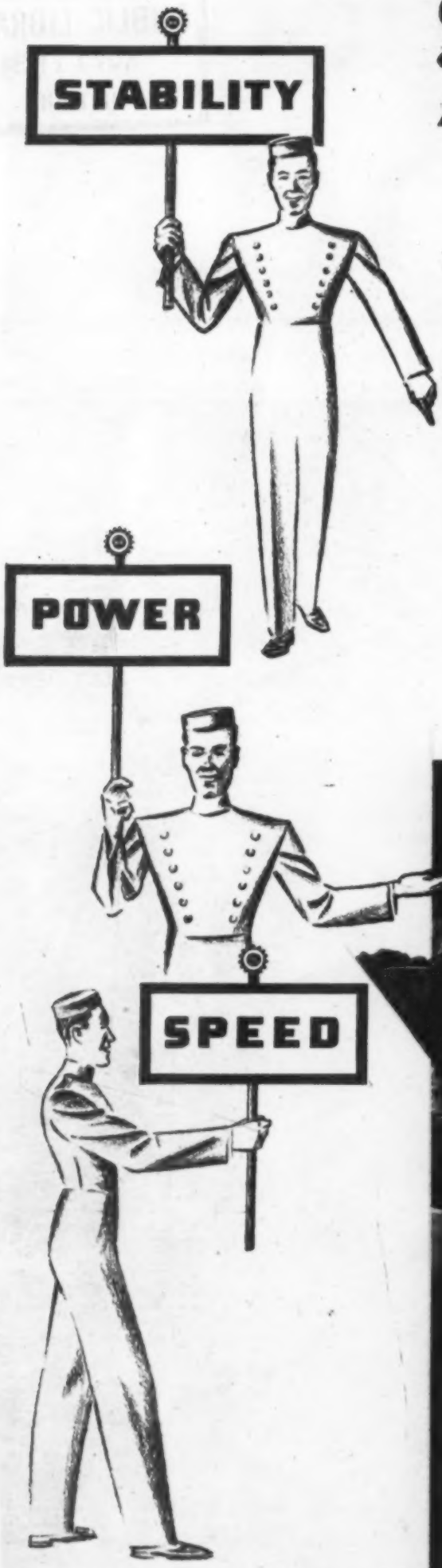
McGraw-Hill Publishing Company, Inc.

November, 1934

Price 20 Cents



ERECTING CABLEWAY CARRIAGE
at Norris Dam for
Tennessee Valley Authority



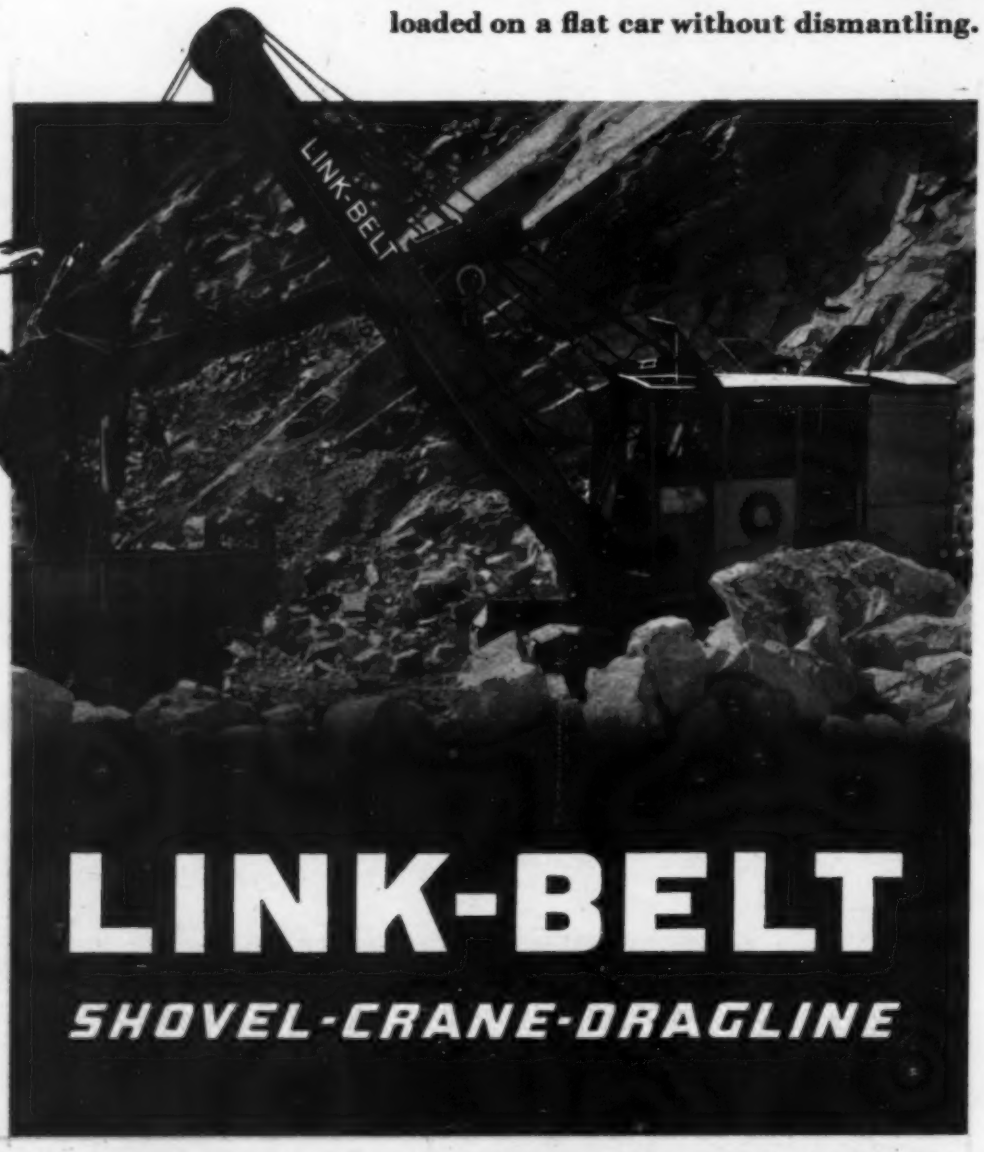
Shows are interesting

BUT THE REAL SHOW IS

"ON THE JOB"

Winning grueling fights against bitter odds builds reputation. The Link-Belt, sound in every part from stem to stern, is a champion on the job. Capable looking on display—a mere indication of its worth in actual use. Only when you see it perform year after year can you fully appreciate its capacity for unexcelled service and compute its true value.

From ¾ to 2½ yds. capacity, heavy-duty built. Gas engine, Diesel, or electric motor drive. All models can be shipped loaded on a flat car without dismantling.



LINK-BELT

SHOVEL-CRANE-DRAGLINE

LINK-BELT COMPANY, 300 W. PERSHING ROAD, CHICAGO

Offices and Distributors in All Principal Cities

5136-A

TECHNOLOGY DEPT.

Construction Methods

McGraw-Hill Publishing Company, Inc.,
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor

NOVEMBER, 1934

WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, N. A. Bowers (San Francisco)
Leonard H. Church (Cleveland), Nelle Fitzgerald

To Stimulate Private Construction

● Greater recognition of the present condition of the construction industry is signified by the decision of Secretary of Commerce Roper's Business Advisory and Planning Council to set up its Committee on private construction as a concentration point where the industry's problems may be studied. The council expects to receive from its committee recommendations which can be passed along to the administration concerning aid that the government can provide to stimulate private construction activity.

With the public works' program passing its peak, a shift in interest to private construction is evident. The limitations of the National Housing Act confined the Federal Housing Administration to home modernization and construction but Administrator Moffett seeks to encourage construction and modernization of industrial plants.

RFC's entry into the mortgage loan business has new construction of the heavy types as its primary objective. The corporation program includes the purchase of preferred stock and capital notes of trust companies and the stimulation of new companies, with additional lending as required to relieve distressed conditions which interfere with refinancing on an equitable basis.

"Substantial recovery of American business cannot be accomplished until private construction is started on the upgrade," the construction committee of Secretary Roper's council reported last month, following a survey on which it has been engaged since its organization last June. Acting on the committee's suggestion, the Business Advisory and Planning Council henceforward will take an active interest in the construction industry and, through Secretary Roper, keep the administration informed of its condition and of proposals for stimulating its recovery.

A Chance for Construction Salesmanship

● Contractors have never been good salesmen of their own services. Through the years they have been more or less content to bid on construction projects publicly advertised or to submit prices on private work when invited to do so. They have never shown much initiative, however, in doing what manufacturers have accomplished with marked success in other fields: *Creating a market* for their products or services. Contractors have devoted their major effort to handling with skill and efficiency the business that came to them, rather than to the function of going out and getting business. That attitude was attended with no serious consequences in the flush days of half a dozen years ago. Now, with construction volume at a subnormal level, the story is different. There's not enough of the normal kind of work—particularly private construction—to keep general contractors busy.

Faced with this condition, contractors, particularly those specializing in building construction, will do well to read, elsewhere in this issue, Mr. McCreery's excellent article on modernization as applied to the specific case of an old building housing a large department store on the Pacific Coast. While the technical details of how the job was handled are valuable in their own right, the job has a larger significance in suggesting opportunities for creating work that contractors are well equipped to do.

On all sides we have ample evidence of the stagnation that exists in the field of new large-scale building construction. Equally evident in most of our larger cities is the obsolescence of many structures that have seen years of service. At a cost only a fraction of that required for new construction, however, these old buildings can be revitalized by modernization methods such as were employed successfully in the case of the Robinson building in Los Angeles. With the results of this case now on record can't contractors create work for themselves by going out and selling the idea of building modernization to some of the leading merchants, industrialists or business men of their communities? It's worth the trial.

Messner, in The Knickerbocker Press, Albany, N. Y.

Getting Him Back on His Feet

Multiple Assessments For Codes Banned

● As a result of protest by the Associated General Contractors of America, the National Industrial Recovery Board, last month, issued a ruling that will relieve contractors from the onus of paying code administrative assessments to several divisional code authorities. The issue was raised by an attempt on the part of the Mason Contractors Code Authority to levy assessments on general contractors who perform their own masonry work. The general contractors' claim for exemption from such payments was based on the recent administrative order of NRA providing that a member of an industry shall be required to pay an assessment only to that code authority governing his major line of business. In its position against multiple payments for code expenses the general contractors have been upheld by the Recovery Board's official ruling.

For a Safer Job

● "Here is a copy of the Ohio safety code. I want you to take it home with you tonight and study it thoroughly. Get out of it every safety practice that we are not using already on this job, and put all the new ideas into effect tomorrow. Make every change that will add to the safety of our work."

Thus spoke the general superintendent of an Alabama contractor to his construction superintendent on a large group of buildings in Virginia. To an experienced eye, the job already told its own story of safe practices in construction. Hoist safety gates were practical and effective; temporary stairs and ladders were strong and securely anchored; woodworking tools were provided with guards; the site was kept clean; pure drinking water was piped to convenient points in the large area—in a hundred ways the project reflected the earnest and practical safety efforts of the builders. But neither the general superintendent nor the construction superintendent rested content with these accomplishments. They realized, as all careful constructors must, that only constant watchfulness and continual betterment can reduce the human losses in construction.

An incident of this kind serves to refute the pessimism that regards all safety propaganda as barren of results. Even more important, such earnest determination to prevent human injuries and save human lives brings nearer the day when the reluctant, the unthinking, and the stony-hearted among contractors will be compelled to give safety its due attention on their jobs. As the more humane and more enlightened employers gain greater respect and lower costs through conservation of their workmen's health and lives, the recalcitrants will find themselves forced by more stringent laws and by keener competition to adopt like safety measures if they wish to survive.

Hunt Those Bottlenecks

TODAY both the alert constructor and the forehanded equipment manufacturer are out hunting bottlenecks. For these are the breeding places of new ideas, new methods, new products, new markets and new profits.

Progress in technical methods and practice rarely is uniform. First we learn to improve one operation, then through our efforts to even up with it, we drive others ahead. This race for overall perfection will be endless so long as progress continues. That is one reason why every construction job has its bottleneck — some definite point in the channel of production that imposes a limit on overall speed, quality or economy.

Perhaps the excavator must be slowed down to favor inadequate equipment for disposal; there may be a bottleneck. Possibly the dry materials pile up on the mixer; there may be another. Sometimes the use of hand labor to unload material will run up the idle time on several machines; there may be a third.

Every constructor can cite many such instances. No job ever is planted so nicely that each piece of equipment is kept busy all of the time at its highest efficiency. Few jobs even approach this ideal. Each has its bottleneck, its arbitrary limit on production, a throttle that determines the overall productivity of the entire plant, whatever may be the capacity of each unit or however efficient each unit may be of itself.

In his striving for the efficiency demanded by present conditions, the alert constructor is studying with increased concern all of his methods and operations. Is his plant layout well adapted to the job in hand? Or does its very nature tend to create bottlenecks? Are the several items of his equipment well adjusted, each to the others, so that he can get the best each has to offer? Is hand labor used at some critical point, slowing down or otherwise curtailing the production of his entire plant? In short, is the entire job organized so that each element of his plant can work as nearly as practicable to 100 per cent of its capacity, as nearly as practicable 100 per cent of the time? In other words, has he eliminated, so far as possible, all of the bottlenecks?

Construction, unfortunately, lends itself to bottlenecks. Therein it differs from factory production, where conditions favor a more delicate and stable adjustment of the many elements that must be assembled to compose a production unit. A construction plant must be improvised to meet the needs of each job and must be assembled at the site. Then it serves for but the life of that job, when it must be taken apart and shipped elsewhere. Each piece of equipment is a unit, usually designed for its own efficiency without reference to that of other pieces or to the overall efficiency of the entire installation. To achieve this last is the major concern of the competent constructor; that is why, when he plants a job, he often settles once and for all whether it will net him a profit or a loss.

The equipment manufacturer also has an interest in bottlenecks. For they offer him an opportunity to help his customers make more effective use of their plant and to demonstrate the higher economies they can realize by the use of more suitable equipment. In some cases they will point to opportunities for new products, designed to avoid or remedy the bottleneck and thereby increase the efficiency of overall production.

In the piping times of plenty we may have been able to tolerate bottlenecks on our construction jobs but in these times they are too heavy a liability unless we use them to stimulate inventive genius and managerial skill. Each of them challenges our ability to improve the speed, quality and economy of production; each, therefore, is a key to greater profits for the constructor and new opportunities for the manufacturer.

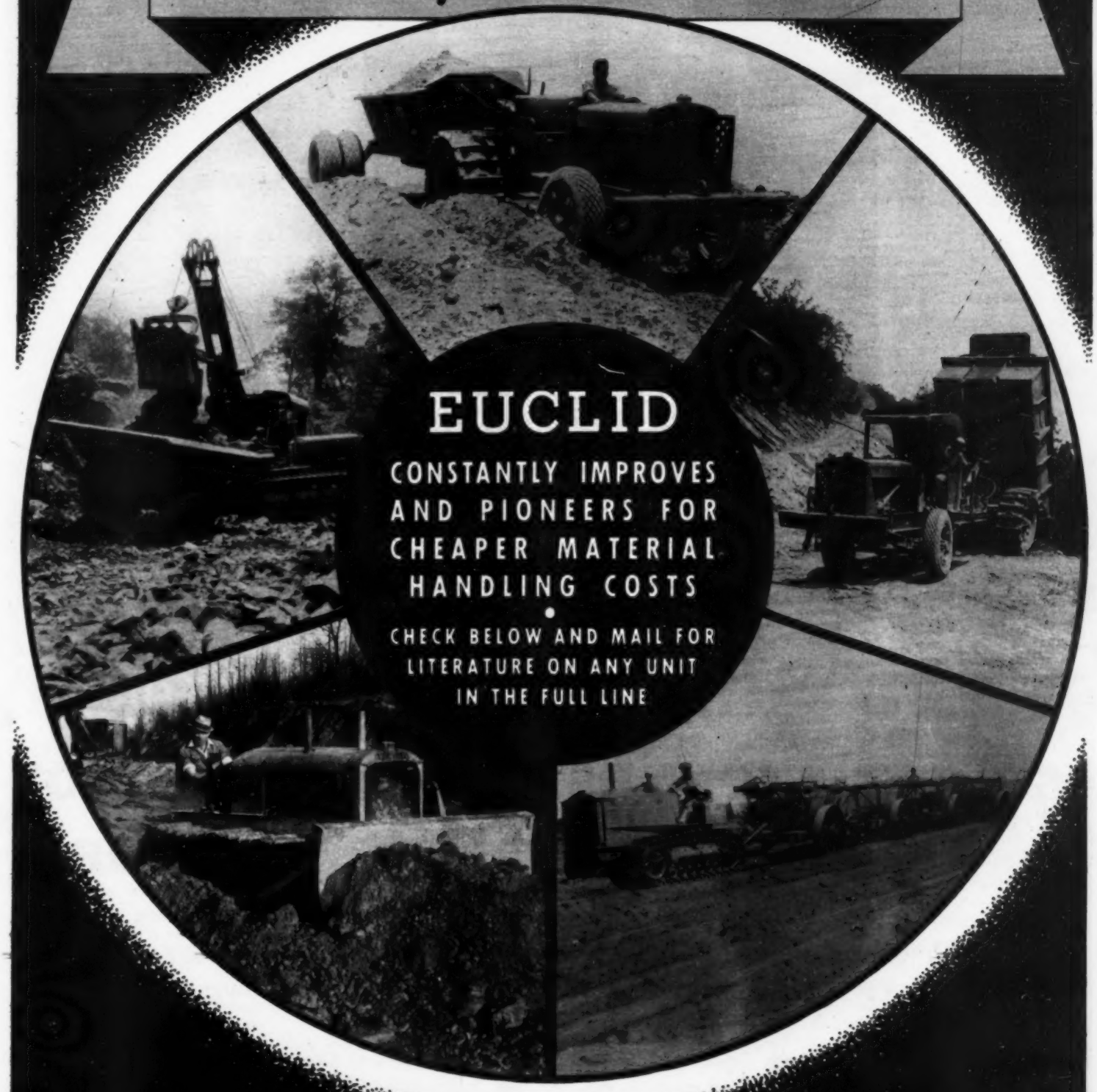
Willard Chevalier

CONSTRUCTION METHODS. November, 1934. Volume 16, Number 11. Published Monthly, price 20¢ a copy. Subscription rates—United States, Mexico and Central and South American countries, $2.00 a year. Canada, including duty, $2.50 a year. All other countries, $4.00 a year or 16 shillings. Entered as second class matter October, 1926, at Post Office at New York, N. Y., under the act of March 3rd, 1879. Printed in U.S.A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C. Copyright 1934 by McGraw-Hill Publishing Co. Inc., 330 West 42d Street, New York, N. Y.

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

Editorial and Publishing Offices: 330 West 42d St., New York; 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C. James H. McGraw, Chairman of the Board; Malcolm Muir, President; James H. McGraw, Jr., Vice-President and Treasurer; Willard Chevalier, Vice-President; B. R. Putnam, Secretary.

SPINNING THE WHEEL OF PROGRESS
FROM *Scoop* TO *Modern "Truk"*



EUCLID

CONSTANTLY IMPROVES
AND PIONEERS FOR
CHEAPER MATERIAL
HANDLING COSTS

•

CHECK BELOW AND MAIL FOR
LITERATURE ON ANY UNIT
IN THE FULL LINE

FULL LINE Trac-Trucks--(Tractor-Trailer ☐ Truk Model ☐) Bottom Dump Wagons--(Crawler ☐ Floating Duals ☐) Tu-Way Wagons ☐ Bulldozers ☐ Tamping Rollers ☐ Rotary Scrapers ☐ Wheel Scrapers ☐ Log Wagons ☐ Trac-Wheels ☐ Trac-Truk Tractor ☐

THE PIONEER

THE EUCLID ROAD MACHINERY CO.

CLEVELAND, OHIO

AMERICA GOES DIESEL · AMERICA GOES DIESEL · AMERICA GOES DIESEL

▲ This bulldozer-equipped "Caterpillar" Diesel Seventy-Five Tractor supplies low-cost, dependable power to Contractor Clarence Young for a mountain road building job near Butte Meadows, California.

▼ This is one of three "Caterpillar" Diesel Seventy-Five Tractors on Mr. R. Reland's contract at Coulee Dam. Working 20 hours per day. Moving 11 to 12 yards per trip. Fuel cost is only about 30 cents per hour.

◀ Pulling a "Caterpillar" Elevating Grader, this "Caterpillar" Diesel Fifty Tractor is doing canal construction work for the Irrigation Department of the Union of South Africa.

AMERICA GOES DIESEL · AMERICA GOES DIESEL · AMERICA GOES DIESEL

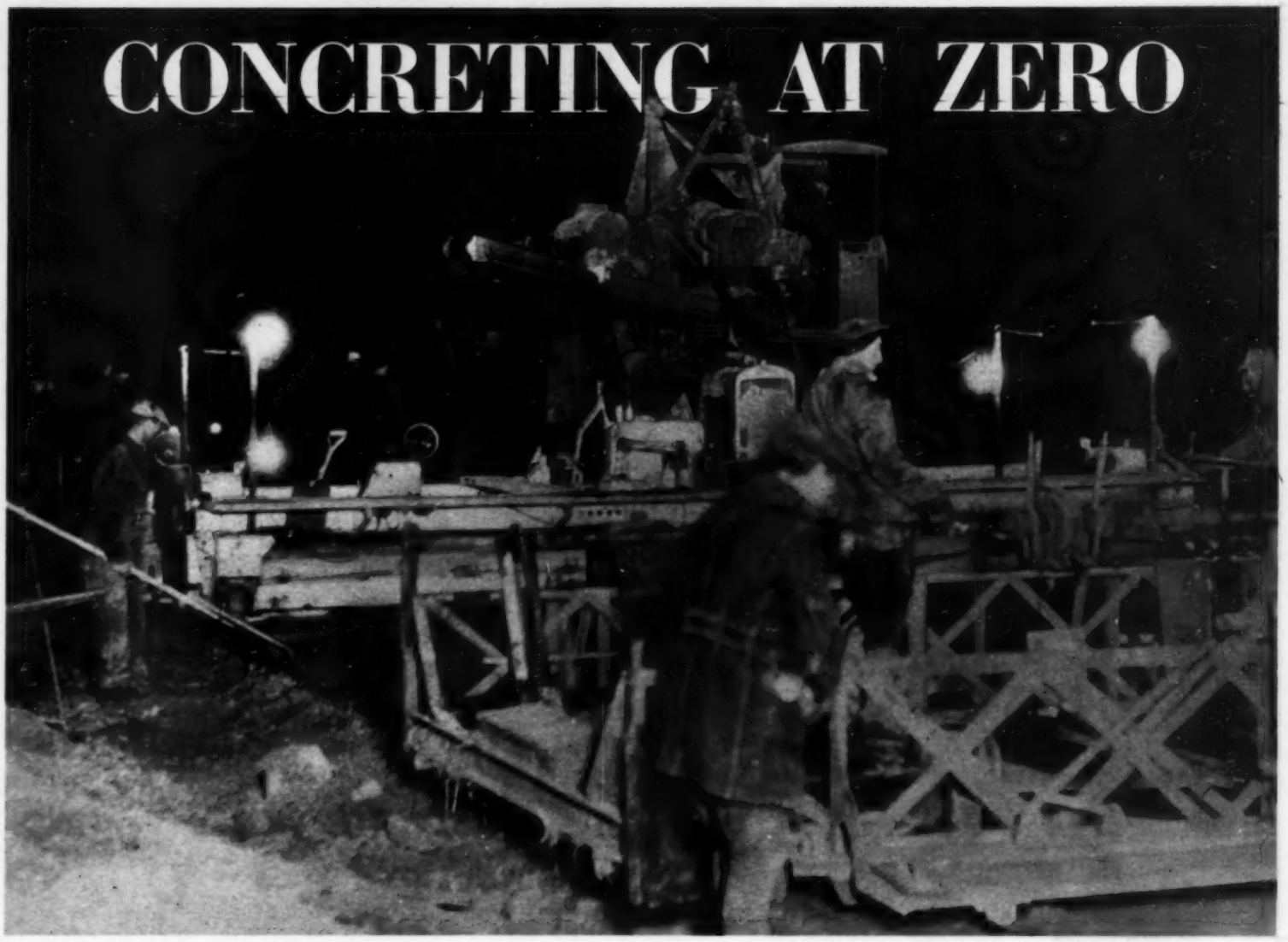
"SO WE INCREASED OUR FLEET OF 'CATERPILLAR' DIESEL TRACTORS"

—SAYS H. W. McKINLEY, GLENDALE, CALIFORNIA, CONTRACTOR, AFTER HIS COST RECORDS SHOWED THAT THREE BIG "CATERPILLAR" DIESEL TRACTORS WERE COSTING LITTLE MORE FOR FUEL THAN ONE 30-HORSEPOWER GAS TRACTOR.

Another southern California contractor, Clarence Crow, of Crow Brothers, writes: "Our fuel cost for each of our 'Caterpillar' Diesel Seventy-Five Tractors is only one-fifth of what it used to be for our big gas tractors."

Other owners, everywhere, report similar results. Says E. B. Boyle, President of the Boyle Road and Bridge Company of Sumter, S. C.: "Fuel for the 'Caterpillar' Diesel costs us less than 1/3 the cost of fuel for a gas machine of the same size." From Pickering, Mo., Mr. L. O. Killion writes: "Ten to twelve gallons of fuel is driving the Diesel Thirty-Five the same number of hours that 25 gallons of gasoline did the gas 30-h. p. tractor, besides doing one-half more work."

More work—less cost—such are the results reported by the thousands of enthusiastic owners of "Caterpillar" Diesel Tractors and Power Units. That explains why more and more users of tractors and stationary power are going Diesel—with "Caterpillar." Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



Summer job progress in Winter —Heat-curing costs reduced

Concrete temperatures are the controlling factor in Winter work; air temperatures only affect heat and protection requirements. Results depend upon how effectively curing temperatures are maintained, and upon the time required for cement to provide service strength. *The quicker concrete hardens, the less time and expense required for heat protection.*

Winter Advantages of 'Incor'

Through a basic process improvement, 'Incor' Cement cures or hardens 5 times as fast as ordinary Portland cement. Result, heat protection costs 60 to 70% lower, cold-wave hazard minimized, Summer schedules possible even in dead of Winter.

These advantages are particularly important in highway construction. Bridge building can be carried on throughout the Winter. 'Incor' also lengthens the paving season, making it possible to close gaps and complete highway sections which might otherwise lay over until Spring. Traffic isn't forced to use open sub-grade, contractors receive substantial estimates.

Resurfacing a 1½-mile section of Hamilton-Eaton Road in Southwestern Ohio, illustrates these advantages:

First concrete poured December 5th, last December 30th. Finished grading carried 500 ft. ahead of mixer, subgrade straw-covered at night, thawed out in morning with hot water and steam. Water heated by boiler mounted on skids, drawn along by mixer. Concrete placed on grade at 70°, covered with wet burlap and 10″ of straw, protected until 600 lb. beam-strength permitted opening.

Beams and cylinders, cured with pavement, averaged 72-hour opening strengths. December 26th night temperatures dropped to 7° below zero; next morning temperature under covering was 44°. *Cores of 'Incor' concrete cut from that day's run, developed 24-hour compressive strength 1509 lbs., 48-hour 2610 lbs.*

In severe winter weather, 'Incor' concrete was ready for service sooner than with ordinary cement in Summer.

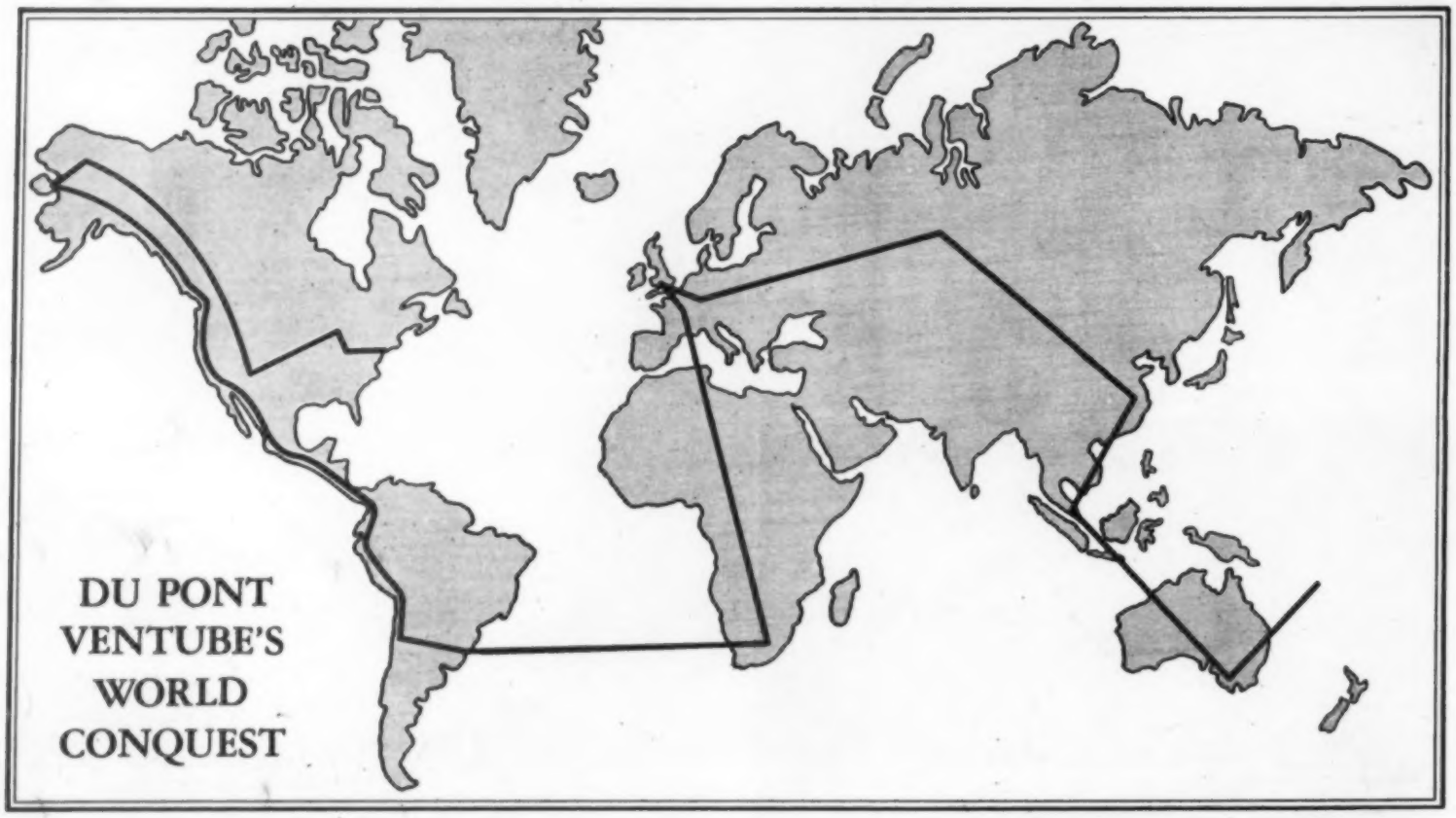
Write for 'Winter' Book

A new, illustrated book on Winter construction is now ready. For free copy, address 'Incor' 24-Hour Cement, Room 2200, 342 Madison Ave., New York. 'Incor'* is made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other leading cement manufacturers.

*Reg. U. S. Pat. Off.

'INCOR' 24-Hour Cement

MAGELLAN COULDN'T MATCH DU PONT VENTUBE'S CONQUEST OF THE WORLD



Du Pont "VENTUBE", by right of its excellence as a ventilating duct, has, in the comparatively few years it has been on the market, won its way around the world.

You'll find du Pont "VENTUBE" used by construction and mining engineers in all sections of the United States and Canada, Mexico, Chile, Argentina, France, Russia, the Balkan States, the gold mining sections of Africa, throughout the Far East and Australia.

The reasons for its choice are known to all engineers who have used it:

1. After blasting "VENTUBE" can be quickly brought to the working face, made to dissipate gases quickly, thus increasing the efficiency of the miners.
2. One man can suspend 200 feet in an hour.
3. Delivers air with a minimum loss and friction.
4. Being highly flexible, it goes anywhere.
5. It is rugged, durable, and through patented construction resists fungi, dry rot and acid.

For information on the use of "VENTUBE" in any tunneling project write to—

FABRICS DIVISION

DU PONT VENTUBE REG. U.S. PAT. OFF.

FAIRFIELD CONN.

E. I. DU PONT DE NEMOURS & CO., Inc.

DO YOU THINK THESE CONTRACTORS would buy NORTHWESTS with NORTHWEST OIL ENGINES unless there was an ADVANTAGE to be gained?

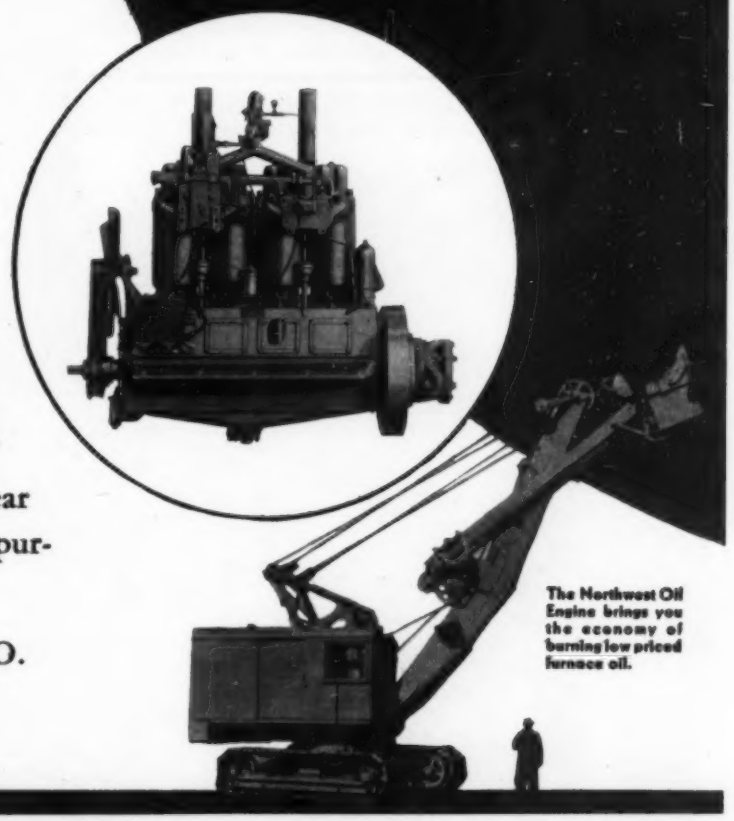
Read these names!

Big, well-known outfits in the construction industry—and they are just a few of the many users of Northwest machines equipped with Northwest Oil Engines!

Concerns like these don't buy just "any machine" on price alone! They look them over—carefully.

Their selection of Northwest means only one thing—that they are assured that there is no better possible purchase to be made.

The reasons for their selection will well bear investigation by any one considering the purchase of excavating equipment.



The Northwest Oil Engine brings you the economy of burning low priced furnace oil.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers

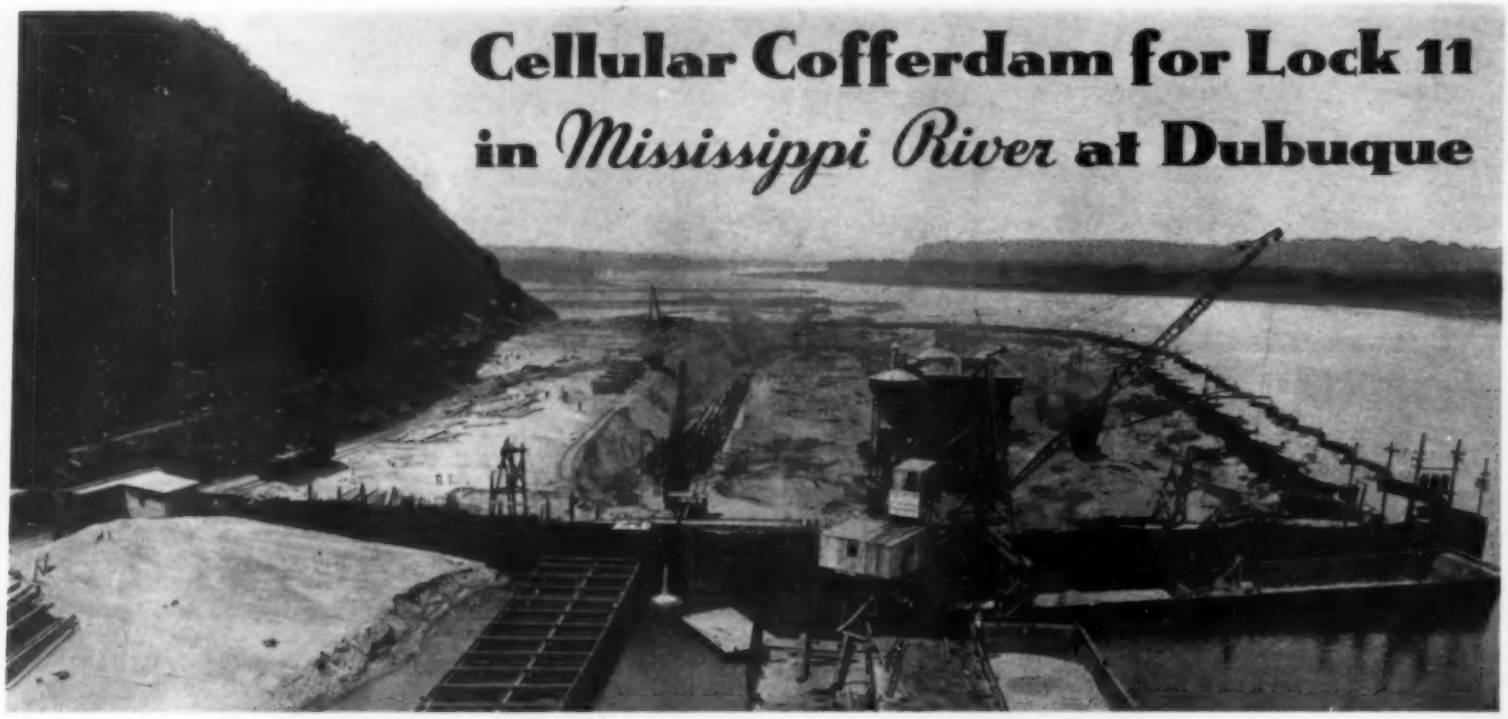
1728 Steger Bldg., 28 East Jackson Boulevard
Chicago, Ill., U. S. A.

SHOVELS, CRANES, DRAGLINES, PULLSHOVELS, SKIMMERS

NORTHWEST

GASOLINE, OIL, DIESEL OR ELECTRIC POWERED

Cellular Cofferdam for Lock 11 in *Mississippi River* at Dubuque



Contractor: Warner Construction Company, Chicago, Ill.

The Project: Government plans call for a lock in the Mississippi River at Dubuque, Iowa, and a dam across the river—one of a series of locks and dams which, by dividing the upper Mississippi into "steps," will make possible extension of the 9-ft. channel.

Before work is begun on the dam, the lock (known as Lock 11) will be constructed within the cofferdam, two views of which appear on this page.

The Cofferdam: Of the cellular type, made up of a series of cells or pockets. The outside and inside walls are a series of steel-sheet piling arcs connected by transverse diaphragm walls of steel-sheet piling, with fabricated Y-piles at the junction points. No wales or tie-rods are required. All the piling in the cells is in tension, due to the pressure of the fill which is placed in the cells to give stability to the cofferdam.

An important advantage of this type of cofferdam is that scouring of the river bottom outside the cofferdam can extend nearly to the bottom of the piling wall without endangering the structure. The steel-sheet piling is not dependent on the earth at the bottom to provide resistance against moving out at the toe, because the outer and inner walls are supported throughout their height by the diaphragm walls.

The Piling: Bethlehem Steel Sheet Piling was used for the entire job—for the cellular cofferdam itself, for the dikes connecting the cofferdam to the shore, for the permanent cut-off wall under the lock walls. Total tonnage of Bethlehem Piling: 3200.

Length of piling in outside wall: 45 ft. In inside wall: 30 ft. In diaphragm walls: 26 to 34 ft.

Because of the strong interlock of the Bethlehem Piling Section used in the cofferdam (Section SP4) it was possible to space the cross walls on 50-ft. centers.

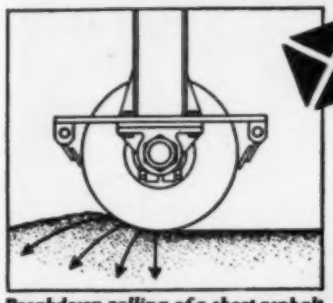
KALMAN STEEL CORPORATION
Subsidiary of Bethlehem Steel Corporation
GENERAL OFFICES: BETHLEHEM, PA.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco. *Export Distributor:* Bethlehem Steel Export Corp., New York.

BETHLEHEM STEEL

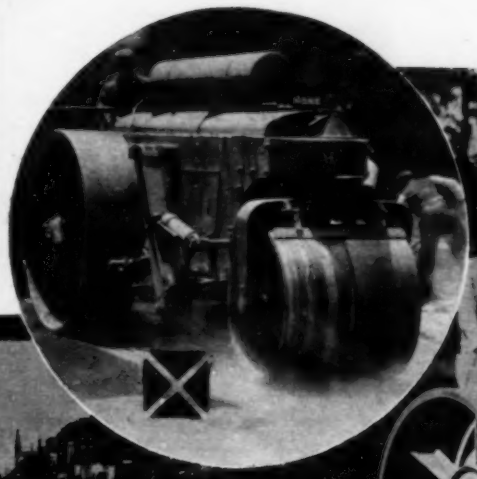
BETHLEHEM *Steel Sheet* PILING

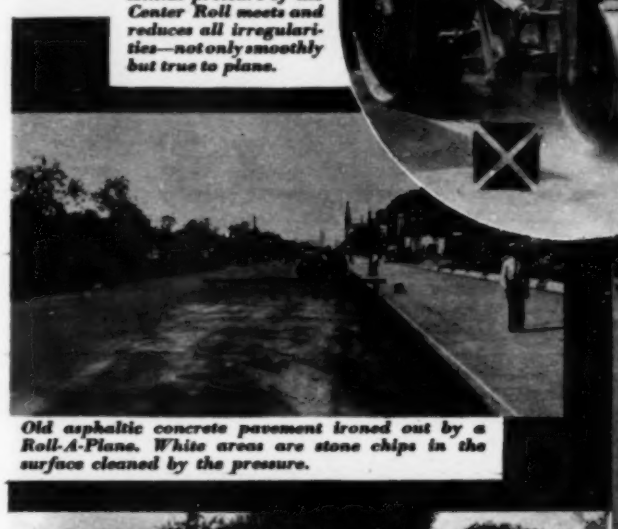
RESULTS . . .

tell the spot-pressure story!

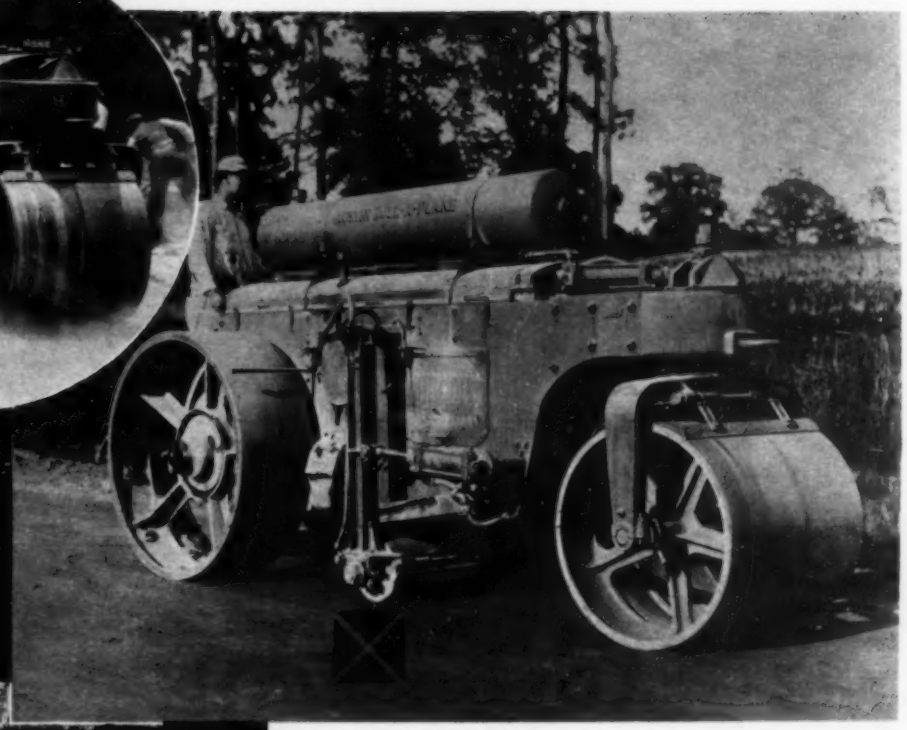


Breakdown rolling of a sheet asphalt pavement. The constant reserve or potential pressure of the Center Roll meets and reduces all irregularities—not only smoothly but true to plane.

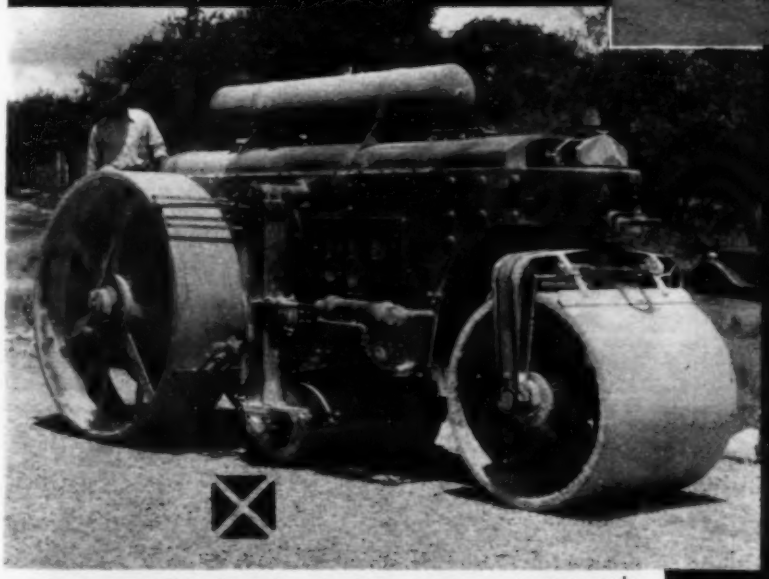




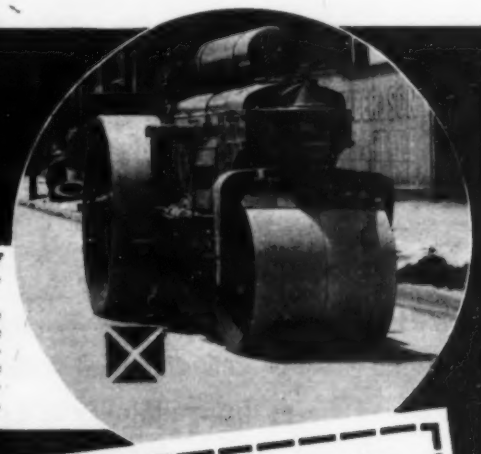
Old asphaltic concrete pavement ironed out by a Roll-A-Plane. White areas are stone chips in the surface cleaned by the pressure.



Entirely new performance from a road roller is demonstrated here in the finish rolling of a road-mix—a true plane surface without cross rolling, the remarkable result of the Center Roll principle.



The Center Roll is shown here on a bituminous macadam job which showed under final test a surface smoothness equal to the usual specifications for pavement of the highest type.



Finish rolling of sheet asphalt pavement.

Write for new 8-page bulletin describing the Roll-A-Plane principle and its remarkable record of actual performance and savings.

The Austin-Western Road Machinery Co.
A 6 Aurora, Illinois

Please send me complete engineering details on the Austin Roll-A-Plane.

Name.....

Address.....

City..... State.....

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS

ROAD ROLLERS

Austin-Western

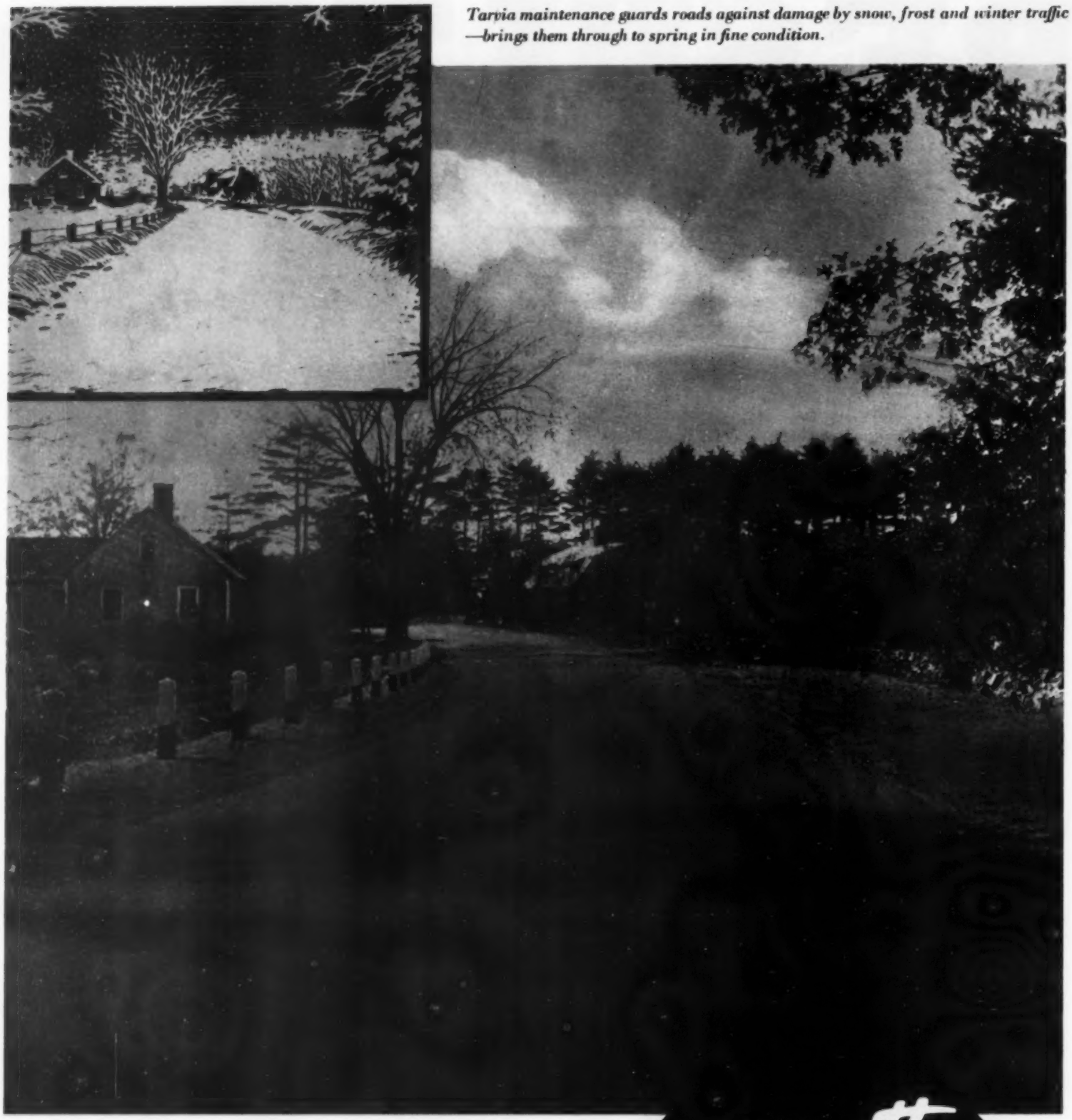
DUMP WAGONS

BITUMINOUS DISTRIBUTORS · ROAD-MIX MACHINES · CULVERTS
SCARIFIERS · BULLDOZERS · TRAILERS · SCRAPERS · PLOWS

DUMP CARS

CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

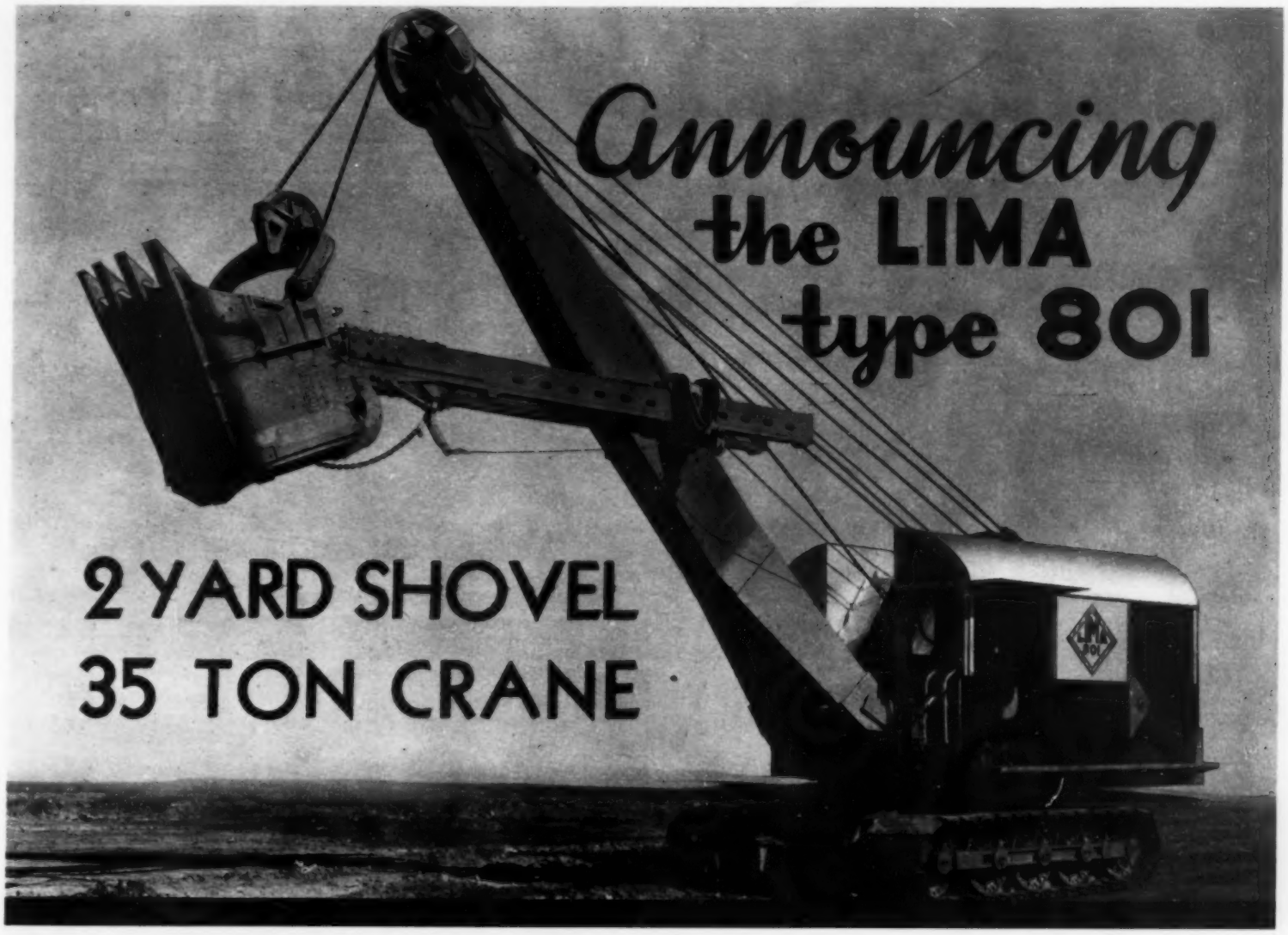
Tarvia maintenance guards roads against damage by snow, frost and winter traffic —brings them through to spring in fine condition.



● With only a few weeks left before freezing weather begins its damaging effect on defective road surfaces, there is still time to take advantage of the availability of Tarvia and Barrett Service to complete your program. Whether you have a new road to build, an old one to surface or widen, or patching to be done, there is a fast and economical way to do it with Tarvia. Tarvia construction and maintenance *now* costs less in the long run, and saves expensive repair bills next spring. Let the Tarvia man work with you. 'Phone, wire or write our nearest office.

Barrett
Tarvia
GOOD ROADS AT LOW COST

THE BARRETT COMPANY
Toledo Milwaukee Detroit Baltimore Bethlehem Rochester Portland, Me.
New York Chicago Philadelphia Cleveland Birmingham St. Louis Boston Minneapolis Columbus Youngstown Lebanon Buffalo Providence Syracuse Hartford Cincinnati
In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver



The Type 801 is a rugged, heavy duty 2 yard convertible shovel, dragline, and crane, embodying features that make possible low cost yardage. It has pep, speed, and mobility that are not ordinarily found in a machine of this size.

The compact design affords exceptionally short tail swing. Only one car is required for shipment. The boom is of box type construction, electrically welded throughout---no rivets or bolts are used in its construction. The chain crowd is independent of other motions. Drums have extra large diameters, which are responsible for the remarkable cable economy. The main machinery, including cone rollers, is equipped with roller bearings. This feature promotes frictionless action, assures perfect alignment of shafts and reduces upkeep expense. All gears are helical cut for smooth, quiet and long life operation. An electric starter within easy reach from the operator's position is standard equipment. All major motions are independent--an important feature when the machine is used as a crane.

The type 801 shovel can be easily and quickly converted in the field into a dragline or crane. When equipped as dragline it will effectively handle a three yard bucket.

For complete details write for a copy of Bulletin No. 81.

THE OHIO POWER SHOVEL CO., Lima, Ohio, U.S.A.

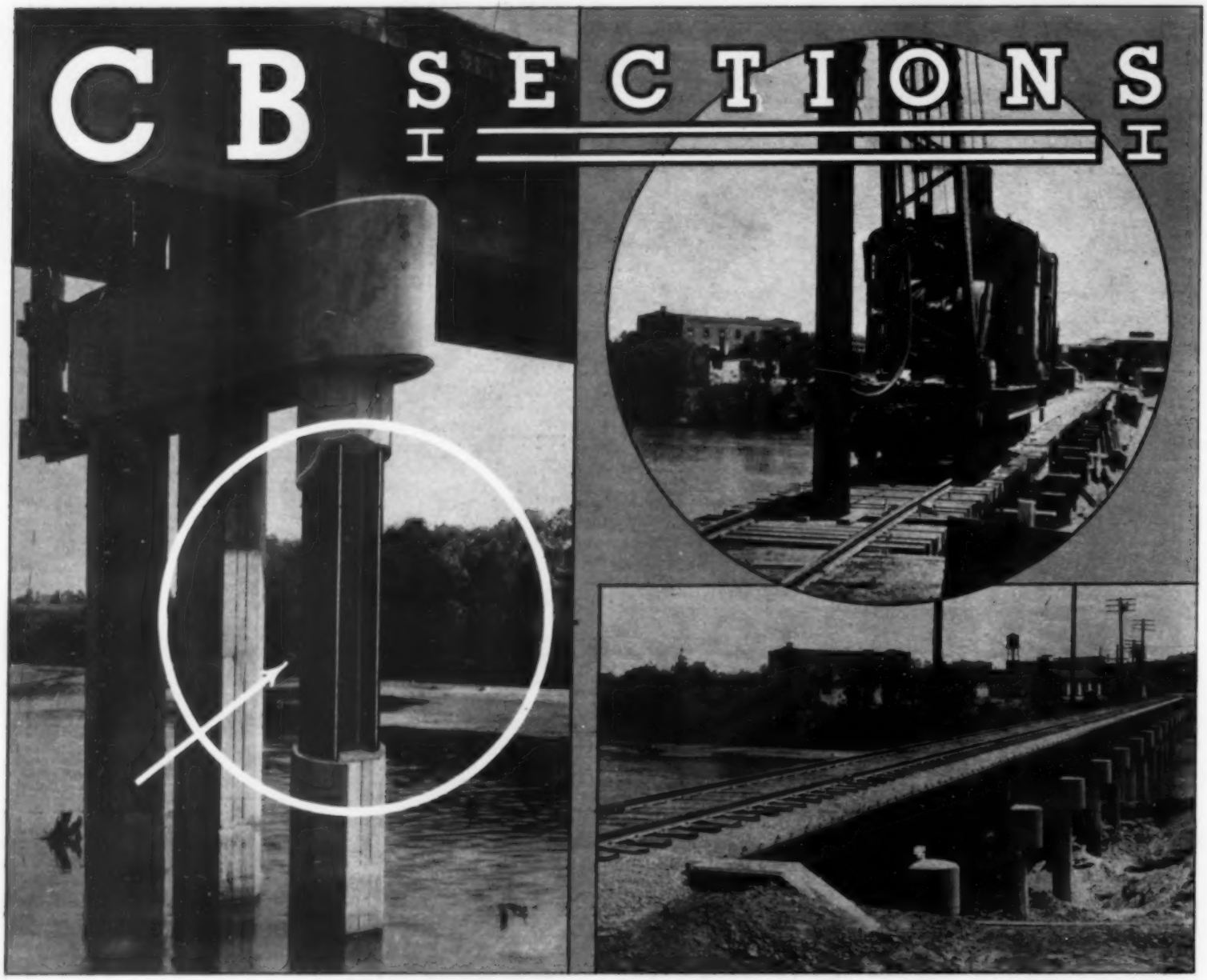
DIVISION OF LIMA LOCOMOTIVE WORKS, INCORPORATED

NEW YORK 167th St. and Sedgwick Avenue | CHICAGO 1543 Steuss Bldg. | NEWARK, N. J. 317 Frelinghuysen Avenue | SEATTLE 2244 First Ave. So. | DALLAS 1303 So. Lamar St. | MEMPHIS 77 McCall Street | The General Supply Co. of Canada, Ltd. Ottawa, Ont. | Tyee Machinery Co. Ltd Vancouver, B. C.

SHOVELS
CRANES
DRAGLINES
HOES

LIMA

CAPACITIES
3-4 YARD 1 YARD
1 1-4 YARD
1 1-2 YARD
1 3-4 YARD
2 YARD



● *The above photograph shows diagramatically the manner in which the steel bearing piles are encased in concrete*

● ABOVE: *The steel bearing piles were driven through the deck of the old structure, without interruption to railway service*

● BELOW: *The finished structure, a Missouri Pacific Railroad Co. bridge at Wichita, Kansas*

STEEL BEARING PILES *now successfully used for* RAILROAD BRIDGES • • • •

● CB SECTIONS, long used successfully as bearing piles under highway bridges, have now been used with equally satisfactory results under a railroad bridge. The accompanying photograph shows the manner in which the steel bearing piles are used—three to a bent. The steel was encased in concrete merely for protection. The piles were driven from the replaced structure without interruption to service.

Steel bearing piles are effective in many cases where bottoms are otherwise economically inaccessible. Piles up to 100′ have been driven without difficulty, in many places where successful penetration has been previously impossible.

Detailed information on CB SECTIONS for bearing piles will be supplied upon request.

Illinois Steel Company

208 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

EXCEPTIONALLY SEVERE SERVICE

24 HOURS A DAY *without a failure*

More than 150,000 feet of Tru-Lay Preformed Wire Rope has been used in building the pier foundations on the West Bay crossing of the San Francisco-Oakland Bay Bridge. Because of the heavy loads and the unusually severe, 24-hour-a-day service, Tru-Lay was used exclusively. The Transbay Construction Co., said: "... there hasn't been a failure of any kind."

•

It is the preforming that makes it possible for Tru-Lay Wire Rope to establish such records time after time, on job after job.

Preforming (which means setting each individual wire and strand at the time of manufacture) removes tendencies to be "cranky"—to kink—to high-strand, or other costly faults.

Tru-Lay requires no seizing at the ends and handles easier—lasts longer—gives more service whichever way you measure: per foot or per dollar.

UNRETOUCHED PHOTO OF ORDINARY WIRE ROPE

UNRETOUCHED PHOTO OF TRU-LAY PREFORMED WIRE ROPE

We will gladly send you either literature or a representative, without obligation

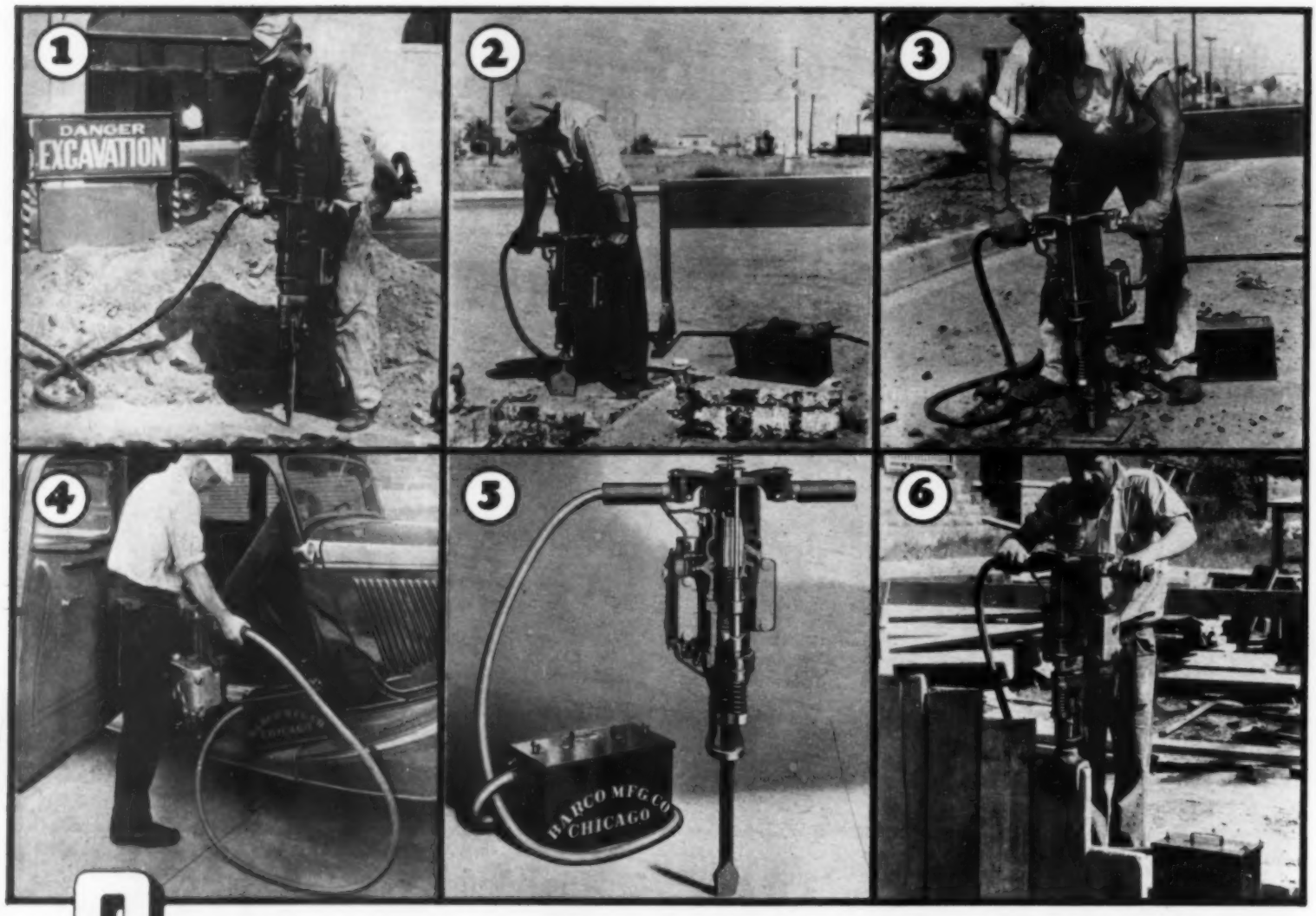
AMERICAN CABLE COMPANY, Inc.

Wilkes-Barre, Pennsylvania

District Offices: Atlanta Chicago Denver Detroit New York Philadelphia Pittsburgh Houston San Francisco

TRU·LAY *Preformed** Wire Rope

* PREFORMING IS A PATENTED MANUFACTURING PROCESS APPLICABLE TO ANY TYPE, GRADE, CONSTRUCTION AND LAY OF WIRE ROPE



SIX REASONS WHY

1 POWER

—This hammer delivers approximately 1500 smashing blows per minute. It has power sufficient for the heaviest demolition jobs and is unmatched for all auxiliary hammer work.

2 NO INTERRUPTION OF TRAFFIC

—The Barco is entirely a self-contained unit with the exception of a small battery box and therefore occupies only the space necessary to do the work in hand. There is no other interruption of traffic.

3 ECONOMY

—The heaviest Barco model weighs but 89 pounds complete and can be handled and operated by one man. It offers the highest efficiency on the job at the lowest operating cost. Total operating expense should not exceed 20¢ per hour.

4 PORTABILITY

—Owing to its weight and compact construction, the Barco is extremely portable. It occupies no more storage space than the average pickax or sledgehammer and is always ready for work.

5 SIMPLICITY

—It consists of a single cylinder, air cooled, two cycle engine with gasoline tank attached. It has but two major moving parts —a piston and an anvil, which transmits the piston blow to the working tool. A nine volt dry battery, contained in the battery box, supplies the ignition.

6 ADAPTABILITY

The Barco is capable of the widest range of operation. In addition to concrete breaking, it is ideal for tamping, shallow rock drilling, digging frozen ground, sheet driving, drilling holes in pavement for use with mud jack in raising low spots, etc. It can be carried to and operated in districts inaccessible to other power hammer equipment.

The BARCO GASoline HAMMER

should be standard equipment for all road contractors' crews, public utility service trucks, municipal and state highway units, water departments, etc.

Address all inquiries to the general office of the

BARCO MANUFACTURING CO.

1801 Winnemac Avenue, Chicago, Illinois

Proved by Actual Performance Facts

BARCO MANUFACTURING CO.,
1801 Winnemac Ave., Chicago, Ill.

Please send me—

☐ Descriptive folder on the BARCO GASoline HAMMER.
☐ Name of nearest distributor for demonstration.

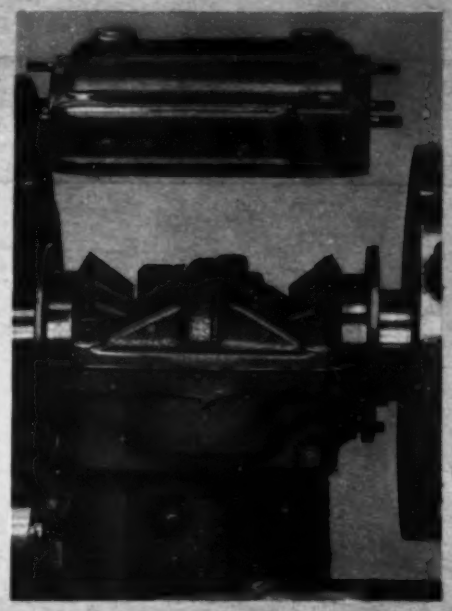
Name .....

Firm .....

Address .....

City ..... State .....

Modern Bucyrus-Eries give long-life service



Where bevel gears are used for reversing the propelling and swinging motions, this simple, long-life construction is used on modern Bucyrus-Erie machines

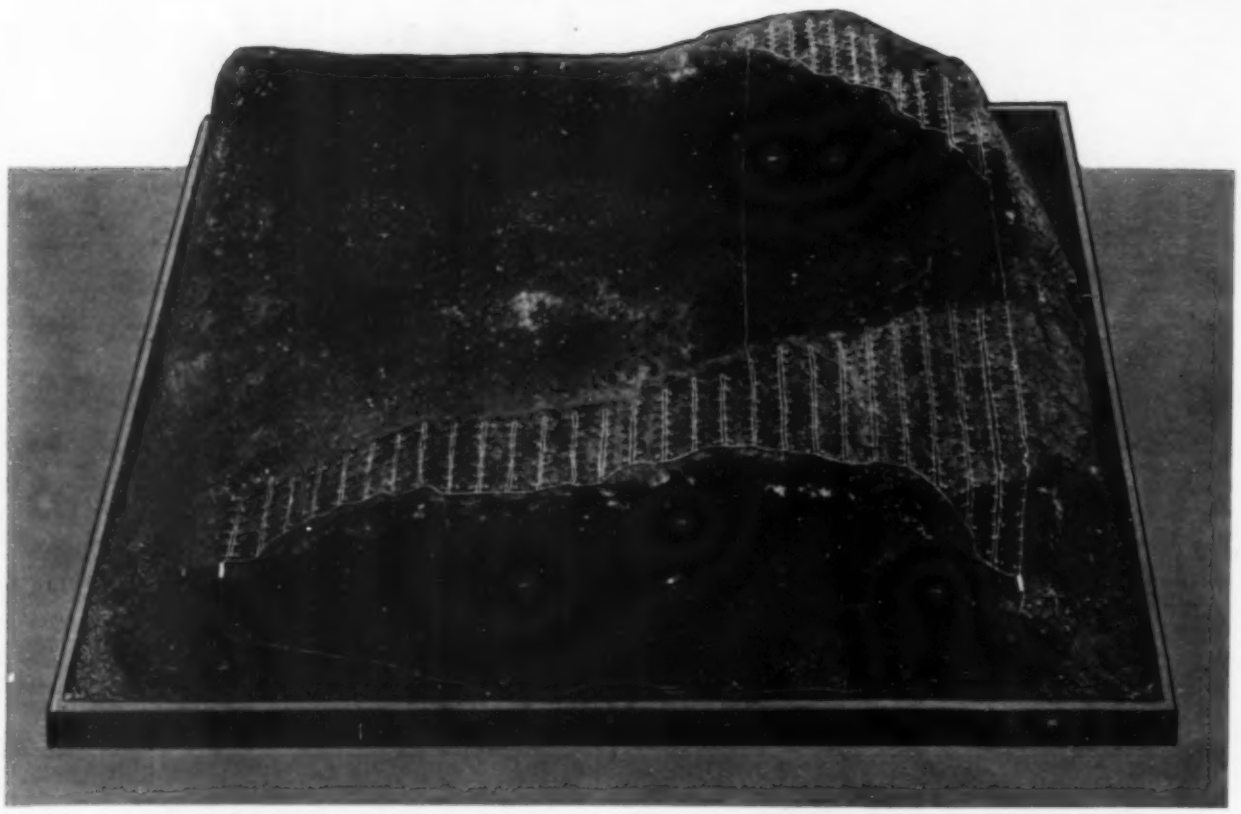
When gasoline and Diesel excavators were first introduced, their life expectancy was far shorter than the old steamers they displaced. But step by step Bucyrus-Erie has built into modern excavators the long life and sturdy dependability for which their famous steamers were outstanding.

As you look over these up-to-date machines, at every point you see evidence of this long life construction. Look, for example, at these reversing bevel-gears for swinging and propelling. Note the ruggedness of the massive casting in which they are held in lasting alignment by large, long wearing ball-bearings. The entire assembly is completely enclosed and runs in oil.

When you compare balanced value, study the strength and endurance of this gear unit. Compare others with the dependable, long-life performance you can see in Bucyrus-Eries.

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

781



A Bird's-eye View . . . close-up!

Here is a model of a "giant blast", detonated and hooked up with Cordeau-Bickford Detonating Fuse. The Cordeau extends from the bottom to the top of each hole, thus detonating the explosive charge throughout its entire length. Since the explosive wave of Cordeau travels at a speed of approximately 3 miles per second, we have the practically instantaneous detonation of the entire charge.

The lines in the drill holes are connected to branch lines, which in turn are connected to the main line. This line has a detonating cap at one or both ends, depending on conditions.

While the detonation of Cordeau is practically instantaneous over the floor of the blast and throughout each charge, the hook-up can be so arranged as to permit relief of burden. In this model the separate charges in each branch line will "go" in succession, starting with those nearest the face of the shot. To the eye it will appear as though the entire blast discharged at once, yet the time interval, infinitesimal though it is, will result in successive relief of burden—more work from the explosives—better fragmentation.

The very features that have made the giant blast practicable and profitable, recommend the use of Cordeau in smaller hook-ups. It is an insensitive detonator—its use simplifies loading, promotes safety. It can be used with well drill, wagon drill or even jackhammer holes.

Consider Cordeau for your jobs. It is widely used in quarry work, and is growing in favor among contractors everywhere. The Ensign-Bickford Company, Simsbury, Conn.

The Cordeau Book gives diagrams, photographs and a factful story of this new technique in blasting. Free to executives.

CORDEAU
DETONATING FUSE
BICKFORD

CB-36

"Better satisfied with this pipe than any we have ever bought"*

Less than two years ago the first length of Super-de Lavaud Pipe was "cast without chill in a metal mold." Since then we have made and sold *more than seven million feet.* Users like this pipe to the point of enthusiasm, as evidenced by comments such as the one quoted in the headline of this advertisement. They find it tougher, stronger, more ductile, and that, with ordinary care, breakage is almost unknown. Doubled impact-strength gives this pipe powerful inherent protection against damage from shocks encountered in transportation, handling and laying. These advantages are made possible by the patented Super-de Lavaud process in which the pipe is *cast without chill in a metal mold.* For further information, write for booklet.

UNITED STATES PIPE AND FOUNDRY CO.
BURLINGTON, N. J.

Foundries and Sales Offices throughout the United States

*From statement of user in our files.

U.S. SUPER-DE LAVAUD PIPE

IMPACT RESISTANCE INCREASED MORE THAN 100%

AT LAST!

A real method that assures a level course of stone

Adnun Black Top Paver laying slag for an airport.

ADNUN BLACK TOP PAVERS

- **Handle any mix—hot or cold.**
- **They lay any width or thickness either of black top or stone.**
- **They need no shoulder preparation or forms.**
- **They crown or bank the road.**
- **They assure an accuracy impossible by hand methods.**

THE MULTIFOOTE PAVER

For years MultiFoote Pavers have led the field. They bring you a combination of advantages that are unbeatable for speed.

The MultiFoote Streamline Skip.
The 45 second Double Cone Drum.
The No-pressure Water Tank.
The Power Operator.
The Power Boom.
The Oversize Bucket.
Reversible 2-speed Traction and MultiFoote Simplicity.

Look at that course of stone! Level, just the proper thickness and uniformly thick all over, no hollows, no ridges, no time wasted in going back to level off either by hand or by blade, no mis-judging in spotting piles as with hand methods, no waste of material and the number of trucks required is greatly reduced — it is positive, accurate and the job is finished when the last load is down. All that is required is rolling.

The Adnun Black Top Paver lays slag or stone with the same ease and precision as it lays black top pavement. Edges are true and there is no overlapping of parallel courses but edges abutt perfectly and leave no ridges.

Adnun engineers can assure you of positive savings on your next stone spreading job. Don't hesitate to ask for information. There is no obligation.

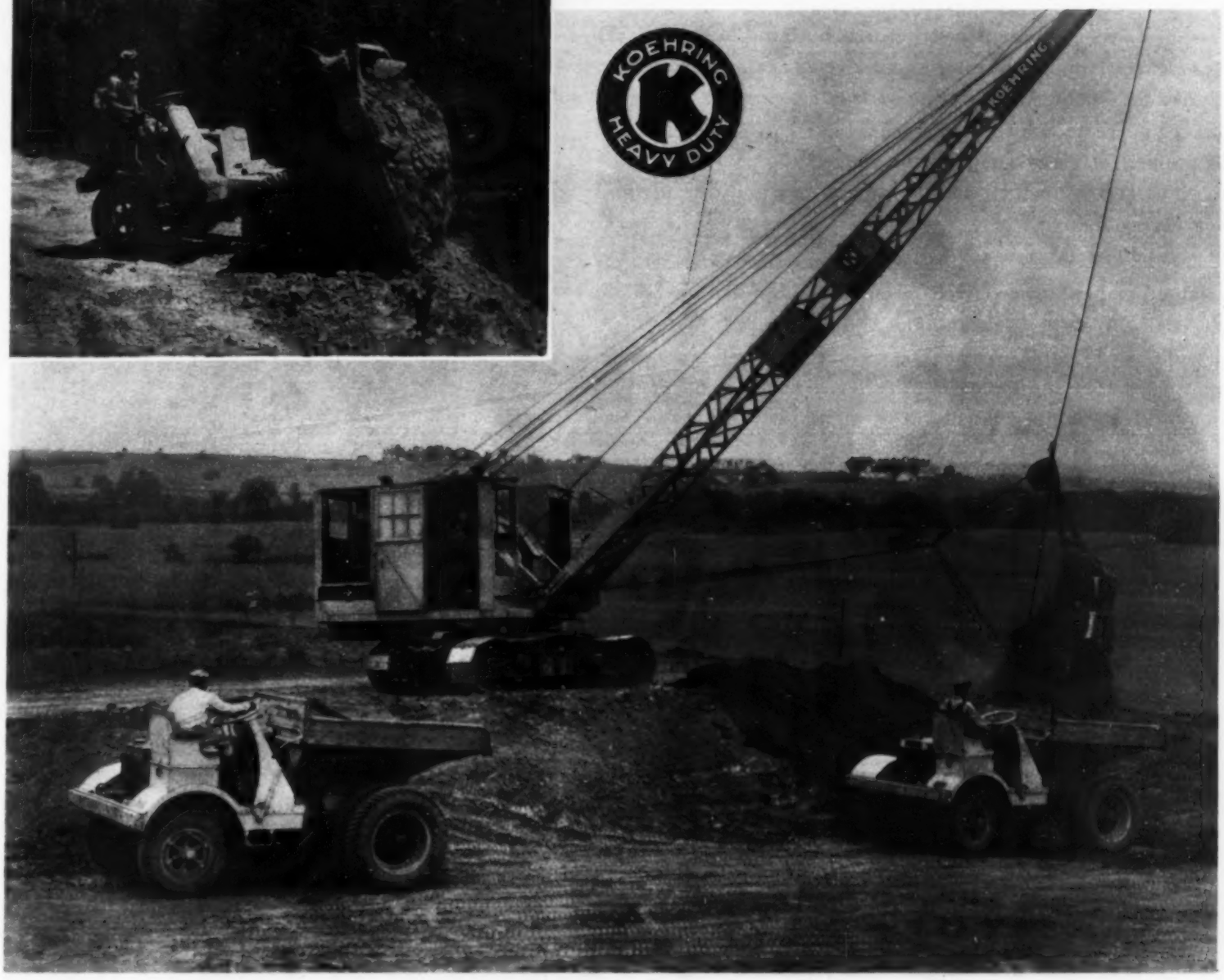
THE FOOTE COMPANY, Inc.
World's largest exclusive builders of Road Pavers
NUNDA, N. Y.

ADNUN BLACK TOP PAVER

the cutter bar strike-off for Accuracy

KOEHRING

The Koehring Wheel Dumptor
for hauling · dumping · spreading



The Koehring Dragline and Dumptor is the Economical Dirt-moving Combination

Road grading, quarry stripping, or any short haul dirt moving job is better and more economically handled by Koehring equipment.

A Koehring Dragline or Shovel, loading the fast moving Koehring Dumptor, moves the dirt with maximum speed and minimum "jockeying" delays. The Dumptor has a low, wide body — permitting quick and easy loading by the shovel dipper or dragline bucket. It has three speeds, forward and reverse—for accurate and speedy spotting at the loading point. The speed and power of the Koehring dragline results in quick loading—the speed and automatic gravity dump of the Koehring Dumptor results in fast travel and dumping.

KOEHRING COMPANY
MILWAUKEE *Division of National Equipment Corporation* WISCONSIN

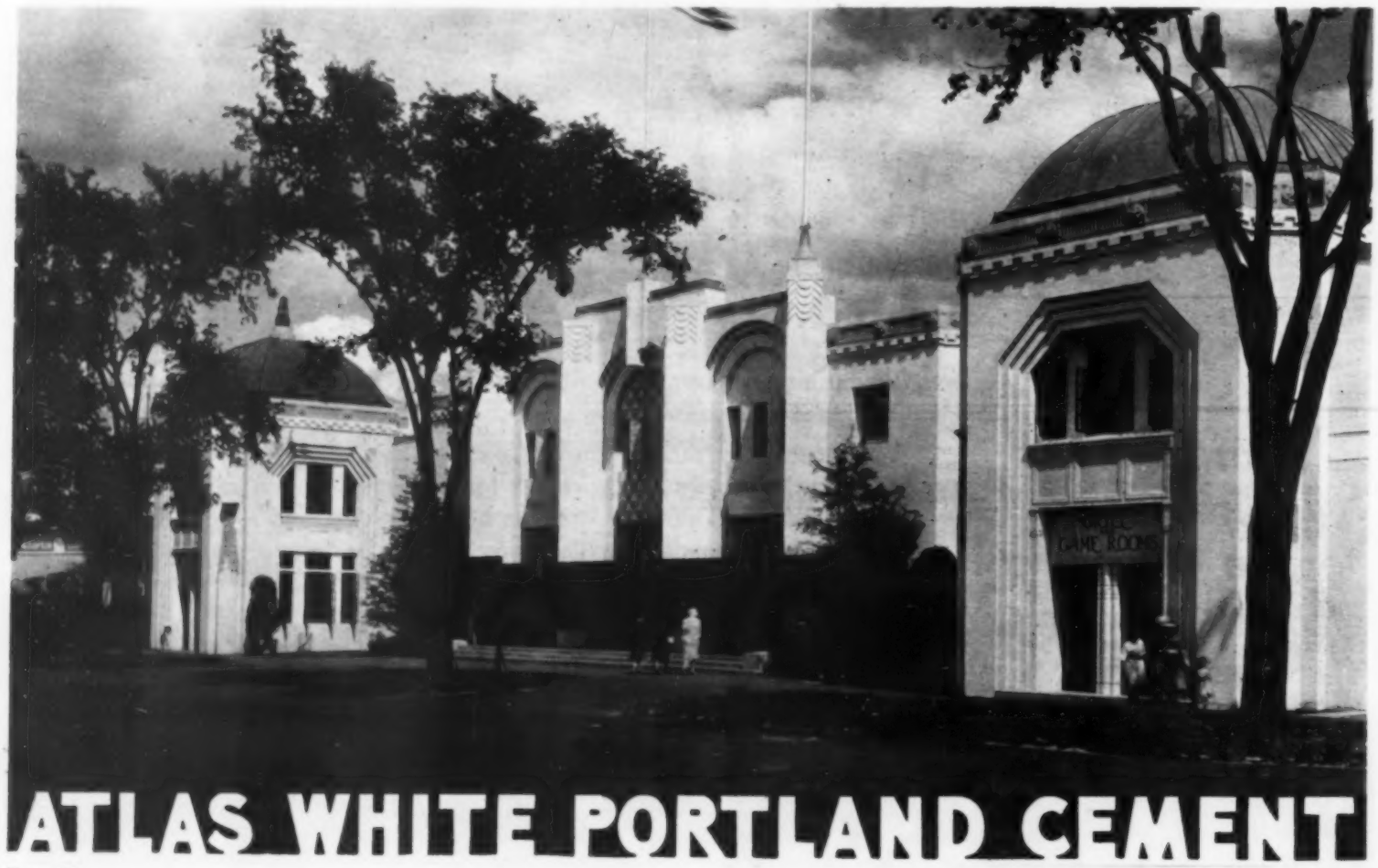
Stucco that grows old gracefully

These two structures, both in Playland Park, Rye Beach, New York, interest the eye as examples of stucco applied in "float finish." The *Artstone* stucco (a prepared stucco) is cream color, made with Atlas White plus pigment. As applied, it gives a monolithic concrete appearance to the exterior, and is, in fact, comparably sturdy and durable and weatherproof.

Not new, these buildings are proving that portland cement stucco, rightly made and applied, grows old gracefully. Weathering adds charm to the pleasant light colors possible with Atlas White. The stucco takes on a warm, weathered tone most pleasing against a background of trees and shrubs and green lawns.

Whatever the texture chosen and in any of the varied colors possible, Atlas White stucco makes an attractive and lasting exterior on almost any type of structure, new or old. You will be interested in the detailed information—write Universal Atlas Cement Co., *Subsidiary of United States Steel Corporation*, 208 South LaSalle Street, Chicago. 181

E. Gisonde, Inc., Mt. Vernon, N. Y., was the stucco contractor. Johnson and Miller, Inc., Yonkers, N. Y., were the general contractors. Walker and Gillette, N. Y. C., were the architects. Artstone Rocor Corp., Brooklyn, furnished the stucco.



ATLAS WHITE PORTLAND CEMENT

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919—McGraw-Hill Publishing Company, Inc. Volume 16—Number 11—New York, November, 1934

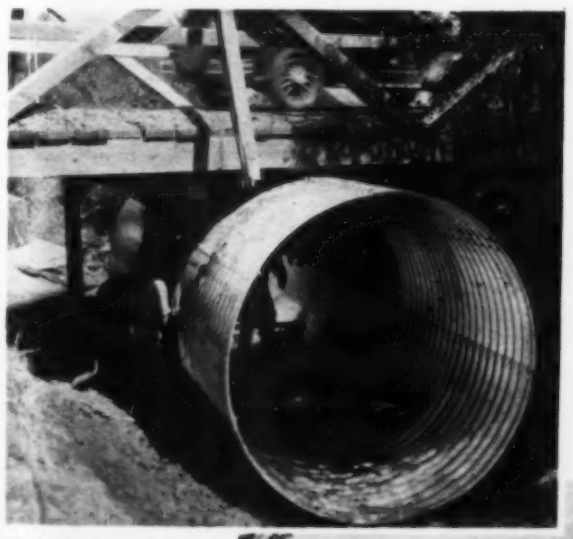
A 105-IN. CULVERT 45 ft. long, built up of Armco corrugated galvanized iron plates, replaced in 24 hr. a narrow wooden bridge in Contra Costa County, Calif., increasing the roadway clearance from 15 ft. to 25 ft. Before closing the highway to traffic, a county road crew under the direction of Harry N. Stow, supervisor, and R. R. Arnold, county engineer, assembled the culvert under the old bridge in 14 hr. Following this work the old bridge was removed, backfill placed, and the road reopened to traffic in a period of 24 hr.

After the culvert foundation had been prepared, the bottom plates were placed in position, beginning with the downstream end. Next the side plates were added, only sufficient bolts being used in each seam to hold the plates in position. The nuts on these bolts were not tightened until the circle was completed. Seven plates were needed for the circle. Standard plates were 10 ft. long, but alternate 5-ft. lengths were used at the ends to stagger the circumferential joints. Following installation of the top plates in the culvert circle, all remaining bolts were placed and tightened.

A power shovel removed the old bridge. The fill around the pipe was stabilized by puddling.

NARROW WOOD-TRUSS BRIDGE affording only 15-ft. road clearance presents serious hazard on county highway.

MULTI-PLATE CULVERT *Replaces Narrow Bridges*



IN 14 HR., county road crew assembles bolted multi-plate culvert *(above)* 105 in. in diameter and 45 ft. long under old bridge.

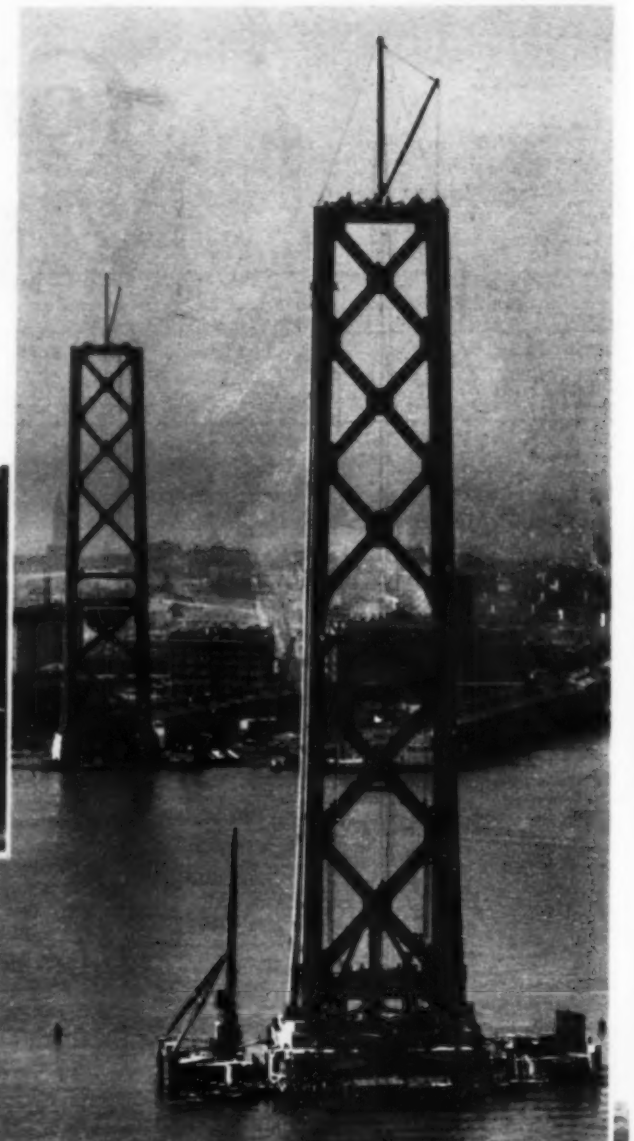
AFTER 24-HR. TRAFFIC INTERRUPTION, backfill has been completed *(above)* and road reopened to travel.

SAFE ROADWAY with clearance of 25 ft. between guard posts supersedes old dangerous bridge after short traffic delay.

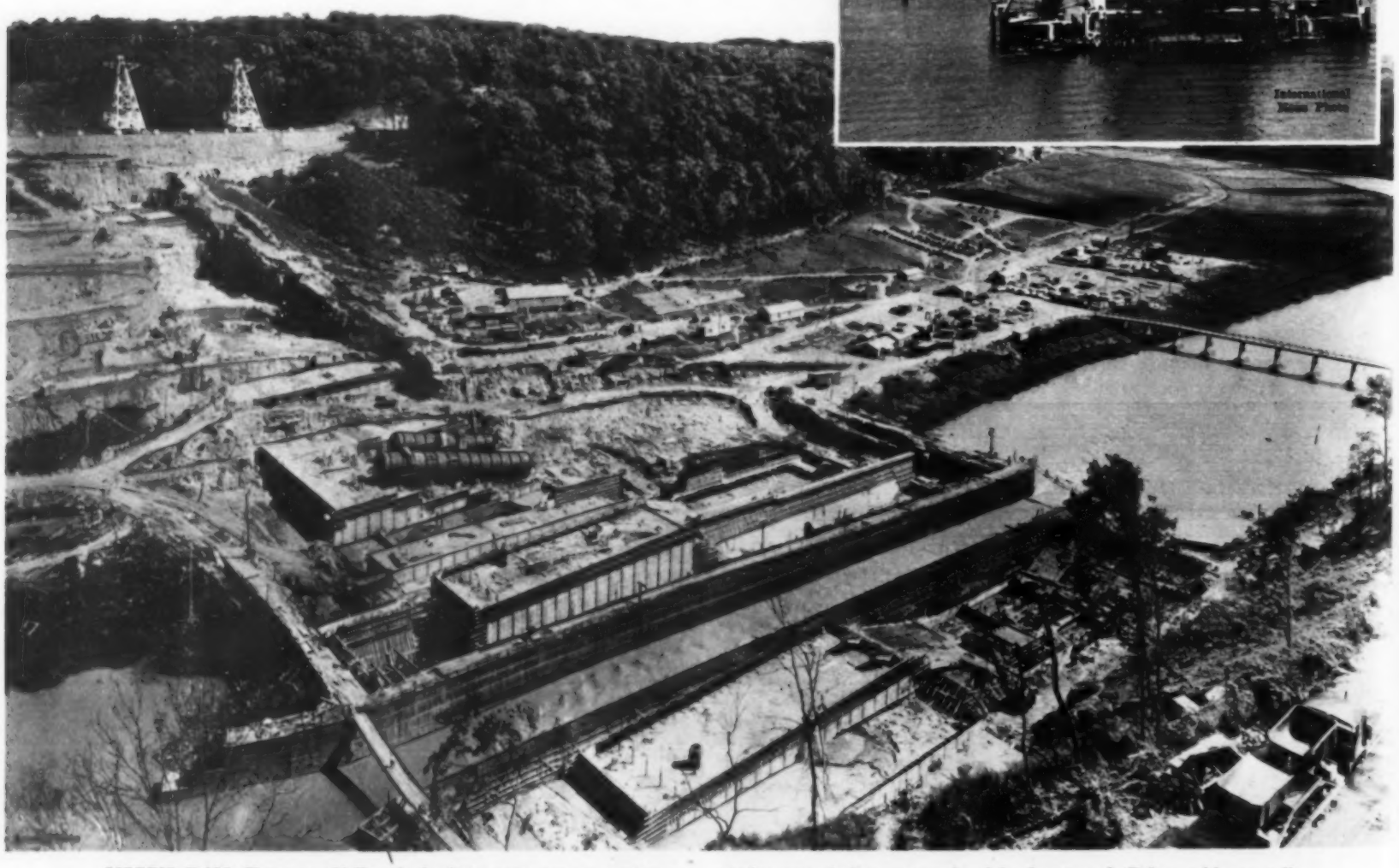
This Month's

"NEWS REEL"

BLAST WRECKS ABANDONED TENEMENT in Atlanta, Ga., as Secretary of Interior Ickes, PWA administrator, inaugurates Public Works Administration's $150,000,000 slum-clearance and low-cost housing program, which includes two Atlanta projects, one for 603 white families, costing $2,700,000, and a second for 617 Negro families, costing $2,100,000.

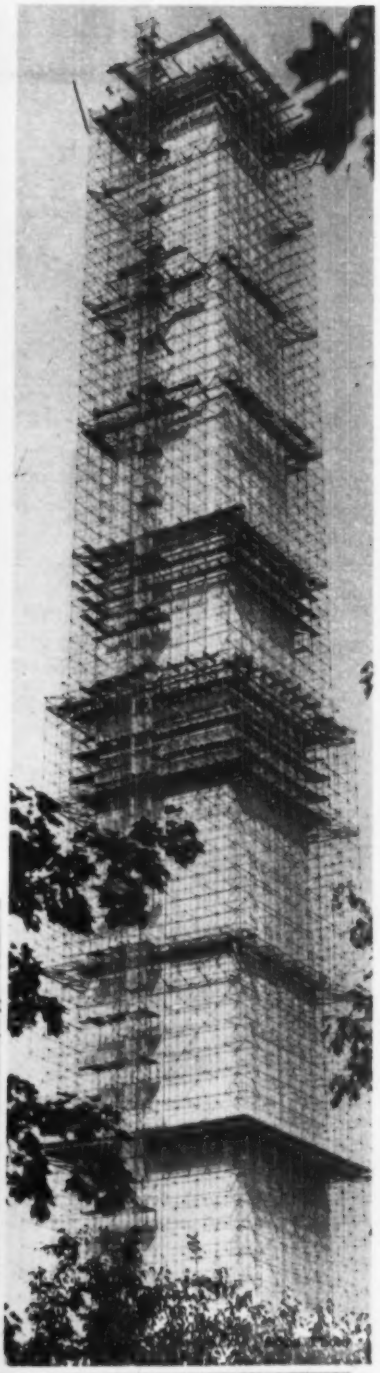


BAY BRIDGE TOWERS *(right)* silhouetted against background of San Francisco haze. These towers will support one of two 2,310-ft. suspension spans of west channel crossing.

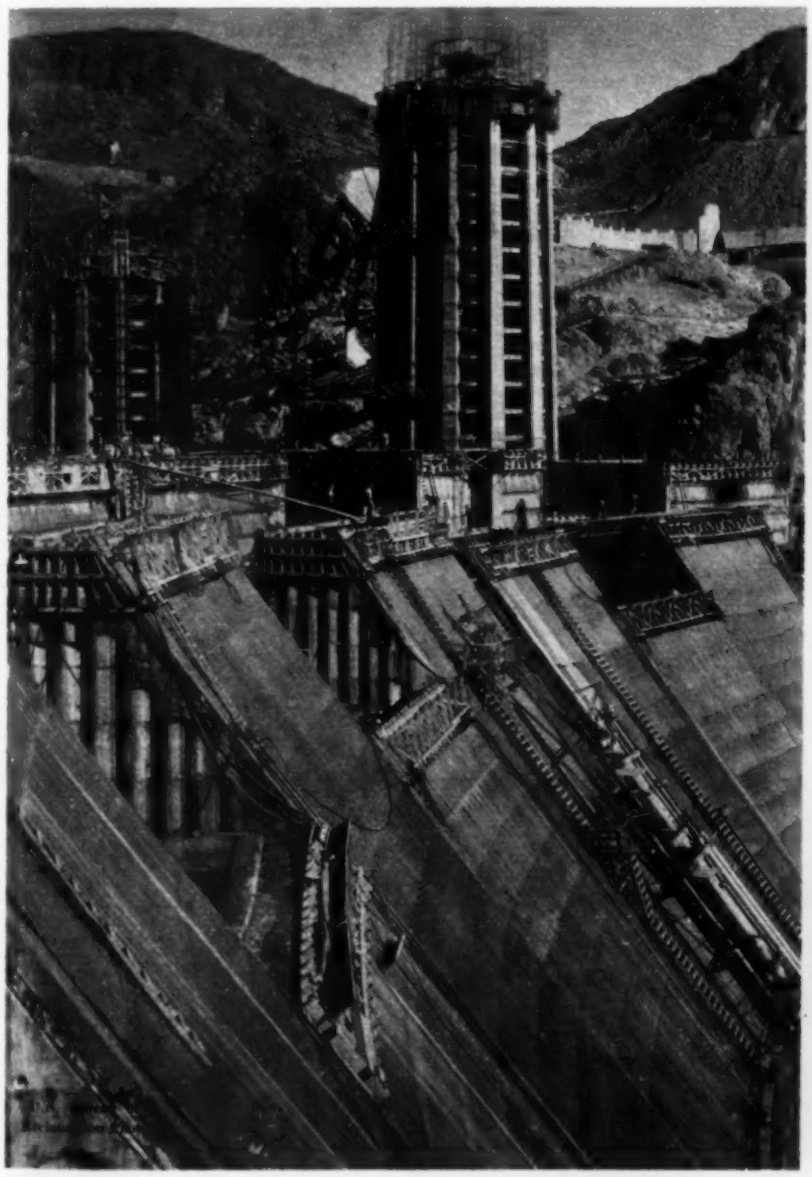


NORRIS DAM, Tennessee Valley Authority's great storage project on Clinch River, Tenn., presents broad panorama of construction, with excavation and concreting in progress inside two earth-filled timber-crib cofferdams, served by two traveling tower cableways of 1,950-ft. span, which transport 6-yd. concrete buckets charged by dual 4-yd. tilting skips on transfer cars similar to one in right foreground. Below cableway tail towers on far side of river can be seen excavation for east abutment and first sections of two penstocks in place. Downstream from dam site are construction bridge and plant buildings. An article fully describing cableways appears on pp. 46-49 of this issue.

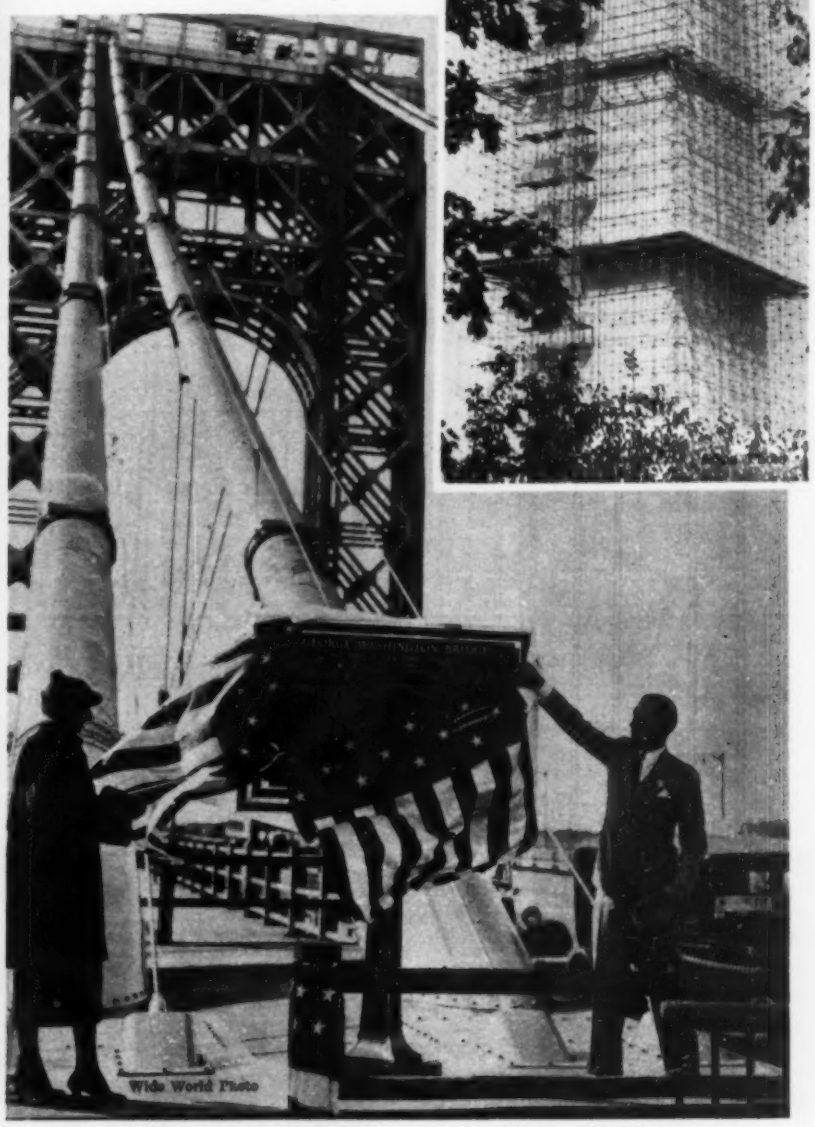
NEW YORK'S LITTLE HOUSE, carefully planned residence for family of five, offers unique and refreshing contrast to towering buildings at Park Ave. and 39th St. Built by local committee of Better Homes in America in collaboration with Columbia Broadcasting System, which uses garage as broadcasting studio for appropriate programs. House is designed and garden is landscaped for beauty, utility and economical operation on slender budget. House can be duplicated outside metropolitan areas in East for $8,000. Complete furnishings cost $3,000 more.



35 DAYS' WORK *(right)* carries highest continuous scaffolding ever built from ground to top of 555-ft. Washington Monument at rate of 1 in. per minute. Steel scaffolding weighs 600 tons. Monument will be washed and deteriorated mortar joints repaired.



BOULDER DAM GROWS STEADILY toward crest elevation. Standing on Nevada abutment and looking across downstream face of dam, cameraman sees two Arizona intake towers rising above concrete forms on dam, 555 ft. above foundation and just 172 ft. short of crest. Keys between columnar concrete sections of dam terminate close to downstream face.



GEORGE WASHINGTON BRIDGE across Hudson River between New York City and Fort Lee, N. J., is marked officially with bronze historical tablets commemorating its construction. Miss Lois Ferguson, daughter of Frank C. Ferguson, chairman of Port of New York Authority, which built structure, unveils one tablet.

MODERNIZATION

Gives Striking New Front to Los Angeles

Department Store Building

By DON HULL McCREERY

Superintendent of Construction, Richards-Neustadt Construction Co., Los Angeles, Calif.

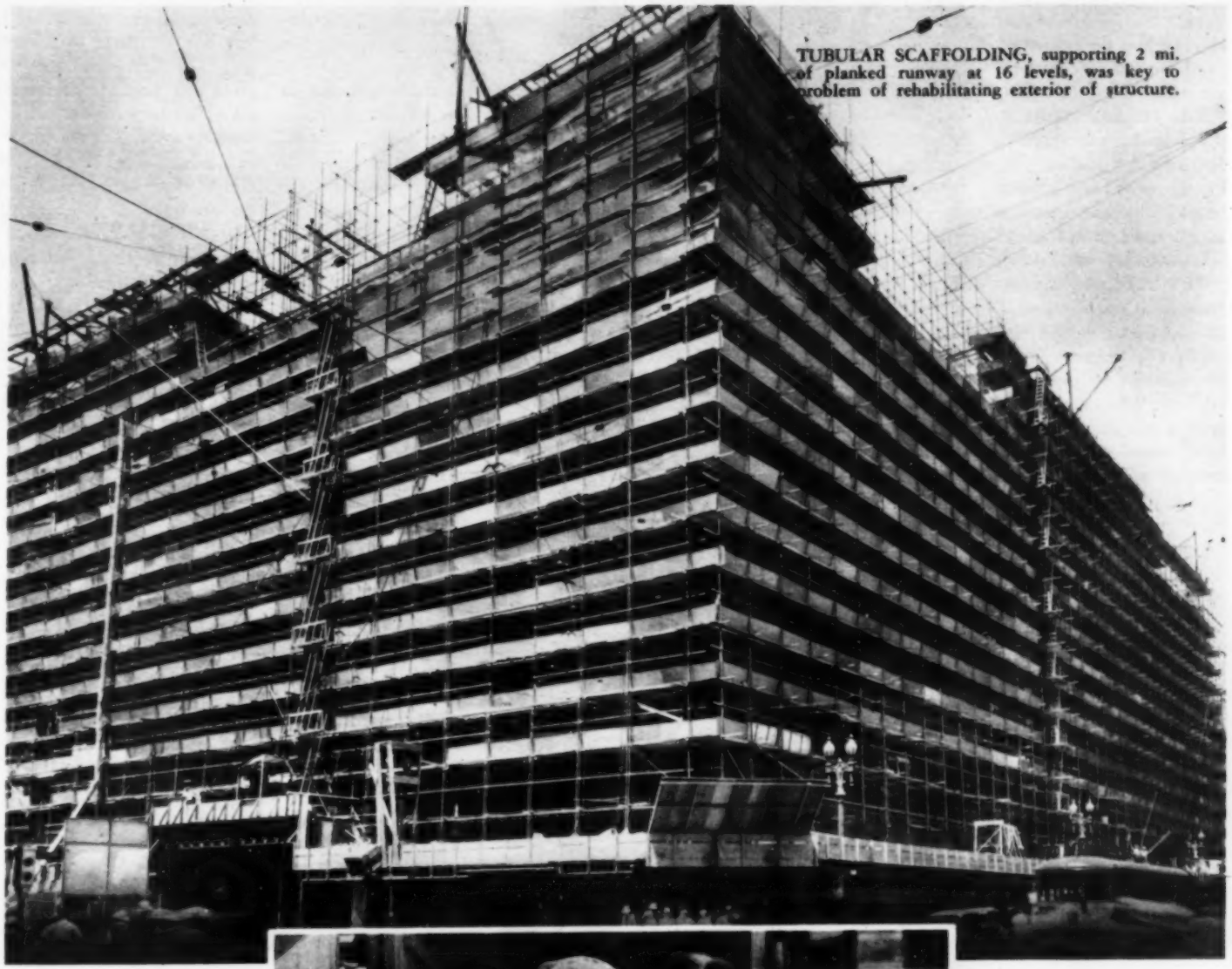
NEW METHODS, new forms and uses for familiar materials, and carefully conducted experiments to determine the proper procedure ahead of actual construction characterized the leading building modernization job in Los Angeles recently completed. At a cost of $350,000 the J. W. Robinson Co., of that city, has carried to completion a modernization program that has produced the city's outstanding commercial building. Seizing the opportunity afforded by the need of some minor repairs to the exterior of the building housing its large department store, the owner removed the original facing and architecture and replaced it with an exterior of subdued modernistic design, built in accordance with the latest engineering practice. The new architecture is achieved through the use of a Gunite shell and a facing of glazed tile and terra cotta.

CONTRAST in appearance is offered by modernized exterior of Robinson department store *(right)*, with Gunite shell and facing of glazed tile and terra cotta, and original structure *(in inset, below)* with its brick walls.

Original Structure — The original construction of the exterior consisted of two independent 13-in. brick walls, one on the line of the structural frame and one from 12 to 18 in. outside of the frame. There was very little tie between the two walls or between the outer wall and the frame of the building. The modernization called for the removal of the outer brick wall back to the structural frame.

Realizing at the start that the scaffold for the work was the key to speed, efficiency and safety for the workmen and the public, the contractor chose a tubular steel scaffold. During all operations of the wrecking and the following construction work, the wisdom of this choice was proved time and again.

Tubular Scaffold — There were sixteen scaffold levels and each level was

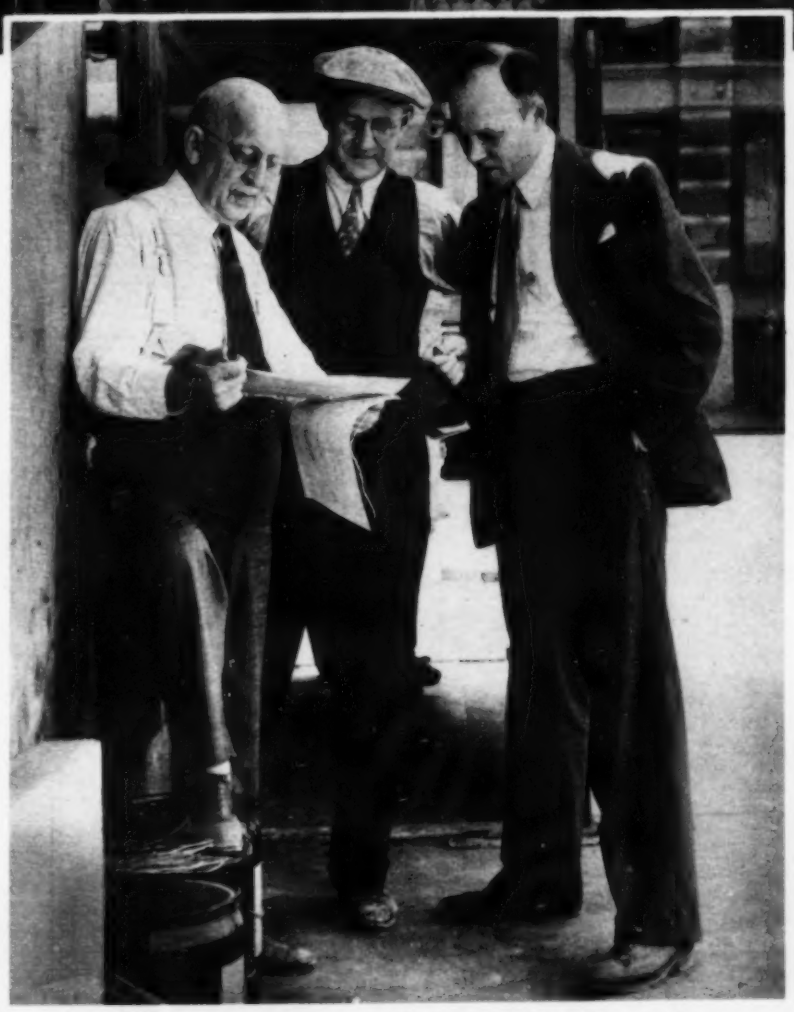


TUBULAR SCAFFOLDING, supporting 2 mi. of planked runway at 16 levels, was key to problem of rehabilitating exterior of structure.

solidly planked with 2x10's and the street side of each level was guarded with a solid curb 24 in. high of ½-in. treated form panel. The scaffold was securely tied and braced to the structural frame at each floor level. At the peak of the job there was more than 2 miles of planked runway 6 ft. wide and 28,000 sq.ft. of panel guard in use on the scaffold. On the topmost level of the scaffold were mounted 5 stiff-leg derricks that handled all the plank, mortar, tile and other materials, used on the work. With all the load of the planking and guards and the added live load from the operations and the derricks, the scaffold showed no over-stress at any time.

Over the sidewalk was a steel canopy that carried all the hoists, materials, working space, tool rooms, and workmen's wash-rooms, as well as all sanitary facilities. The scaffold and canopy supports rested on the sidewalk in front of the store's show windows, but because of the relatively small size of the supports the show windows were in use at all times.

Demolition — The first step in the work was to remove the outer brick wall entirely. Every week day the store is open from 9 a.m. to 5 p.m. The first condition of wrecking was that all work must be done outside of these hours and that the business of the store must not be interfered with at any time. The greater part of the wrecking was done by hand or with hand tools, but compressed air tools were called in where necessary. The wrecking operation started at the top of a given section of the building and cleaned that section to sidewalk level before starting another. Cutting with compressed air tools for anchorages to the structural frame progressed with and directly followed the wrecking. The debris on each scaffold level from both operations was disposed of to trucks on the street through a sectional steel chute. This chute was easily handled from one set-up to another by the derricks mounted on the scaffold.



CONSTRUCTORS—*(left to right)* Charles E. Richards, president, Richards-Neustadt Construction Co., Ed. Roll, job superintendent, and Don Hull McCreery, superintendent of construction and author of accompanying article.

Since there were many thousands of dollars' worth of goods in storage and on display in the store, it was of utmost concern that no dust from the wrecking or the following construction work penetrate to the interior. One of the well-known makes of tough kraft paper and masking tape were the guardians chosen for this important task. So well did they perform their work that not one dollar's worth of damage was reported from dust and only a single instance of small damage from the Gunite work was reported. Every window above the street floor was covered with this paper and all edges sealed with 3-in. tape. As each section of the work was finished the paper and tape were stripped from the

openings with no injury to the windows or frames.

Gunite Shell—To give the outline of the pilasters and mullions desired by the architect the plans called for a 3-in. Gunite shell built out from and anchored to the structural frame as it was left after the wrecking. To accomplish this required a form, or backing, that would hold the Gunite shot against it and at the same time be within reason as to cost. Experiments with paper boards, expanded metal sheets, and other materials resulted in the adoption of Steeltex as the backing material that best satisfied all the requirements. Without benefit of precedent the contractor developed methods of shaping and erecting this material that kept this part of the work well ahead of the following operations and well within a reasonable cost.

Horizontal diaphragms of Gunite were shot in midway between and at each floor level and in these diaphragms were anchored ¾-in. channels on the line of each break in the backing. The Steeltex in flat sheets was broken by hand across the upturned leg of an angle iron on the edge of a low bench. In erection the shapes were fitted and wired to the ¾-in. channels.

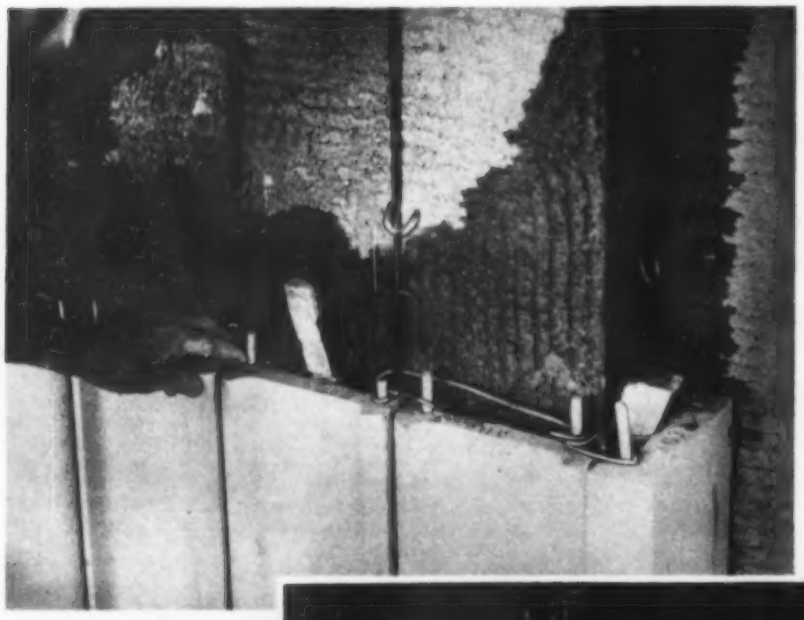
The reinforcing of the Gunite shell and its anchorages was designed to carry not only the vertical loads but also a horizontal load equal to 100 per cent of its weight and that of the facing. Welded trusses, built of reinforcing bars in the sides of the pilasters and mullions, helped to carry the horizontal loads to the anchorages and, in addition, gave stiffness to these members. The horizontal diaphragms mentioned above also acted to carry the loads to the structural frame and to stiffen the Gunite shell. The reinforcing consisted of ⅜-in. round bars, run horizontally and vertically, and one layer of 2x2-in., No. 12 mesh parallel to the face.

A 1,500-cu.ft. per min. electrically-driven air compressor, furnishing air to a central receiver on the street solved the problem of placing the Gunite in large quantities long distances from the gun. This set-up supplied air in sufficient volume at 100 lb. per square inch to place the Gunite effectively on the backing at any point on the building—sometimes as much as 120 ft. above and 500 ft. away from the central plant. The sand and cement were mixed dry in concrete mixers just ahead of the guns in the proportions of 1:4½. Because of rebound losses the finished product on the wall was approximately 1:2½ and consequently gave rather high 28-day compression tests—4,000 to 5,000 lb. per sq. in

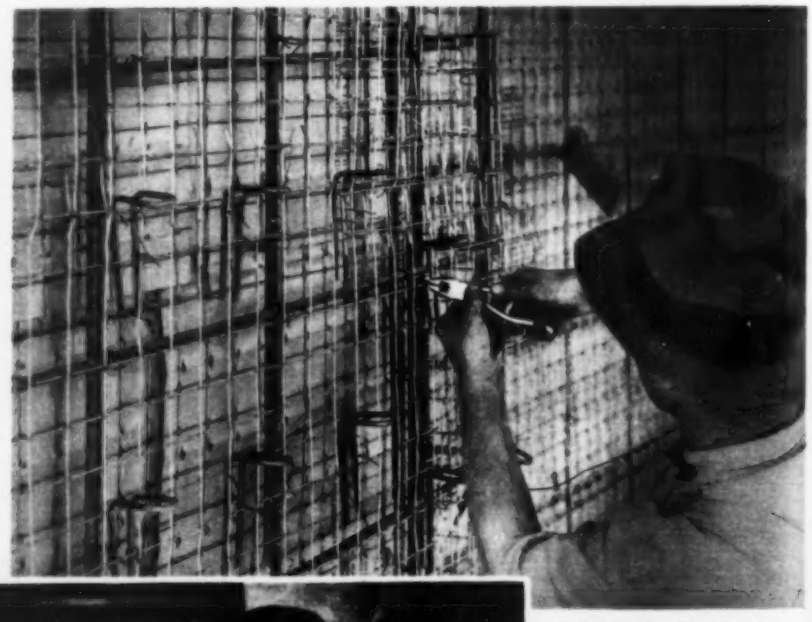
The surface of the concrete shell was carefully screeded to line with a steel-edged straight-edge. The lines, or screeds, were furnished by 18 gage galvanized wire stretched tight between supports on the reinforcing exactly at each outside corner of pilaster or mullion. The position of these wires was given and checked by reference to templates set between each floor on steel brackets screwed to the window frames in the remaining brick wall. With these templates a few moments work with a straight-edge and rule was all that was necessary to check the position of any section of backing, reinforcing, screeds or finished Gunite.

The Gunite was given a coarse finish by criss-cross scratching with a heavy-toothed steel comb, providing an excellent bond for the tile and terra cotta to follow. The difference in weight between this Gunite shell and its facing and the original brick wall was 3,000 tons and the structure was proportionately strengthened by the removal of this load.

Glazed Tile—Pioneering work was



SETTING TERRA COTTA. Detail shows pencil rods threaded through anchor loops, steel dowel pins and No. 7 gage wire ties. Note roughened surface of Gunite in background.



BACKING for Gunite shell, showing reinforcing steel and mesh, and loops for anchoring terra cotta forming new facing.

SHOOTING GUNITE *(left)* on one of the mullions. Arrow points to screed wire and support.

again necessary to bring to a safe realization the architect's conception of a tile and terra cotta exterior facing. Special glazed tile were developed in a local plant just for this building. Experiments with samples of this tile and tests of the results were carried out by the general contractor before the tile setting specifications were written. The primary problem was to insure positive bonding to the Gunite shell and subsidiary to this was the reduction in weight of the facing. Tests of the bond in the actual construction work were even more reassuring than the experimental tests.

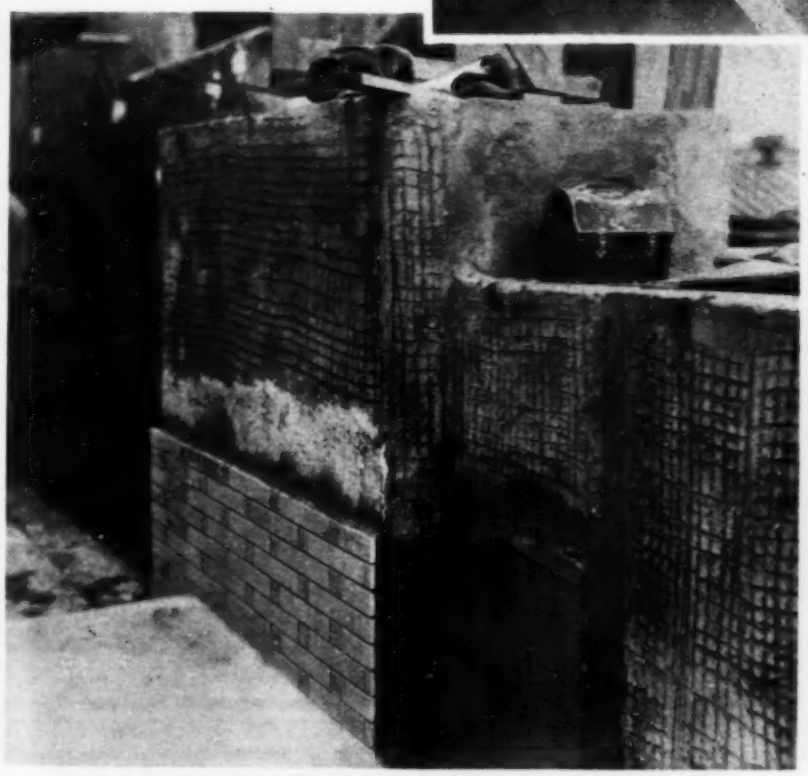
In order that there would be a mechanical bond, in addition to the suction bond, each tile had two undercut grooves on the back. The tiles were 2x6 in. and 2x2 in. and were laid to represent Flemish bond. The bed coat between the Gunite shell and the tile was ¾ in. thick of 1:1.4 mortar well troweled into the rough surface of the Gunite. This is shown in detail in one of the illustrations. On this bed coat was a facing of 1:1 fine sand-mortar applied just ahead of the tile. Each tile was buttered thoroughly on the back with enough neat cement mortar to fill the grooves and then tapped into place on the still fresh bed-coat facing.

ORIGINAL DOUBLE WALL *(left)* **of brick on old structure. Face brick have been removed from outer wall.**

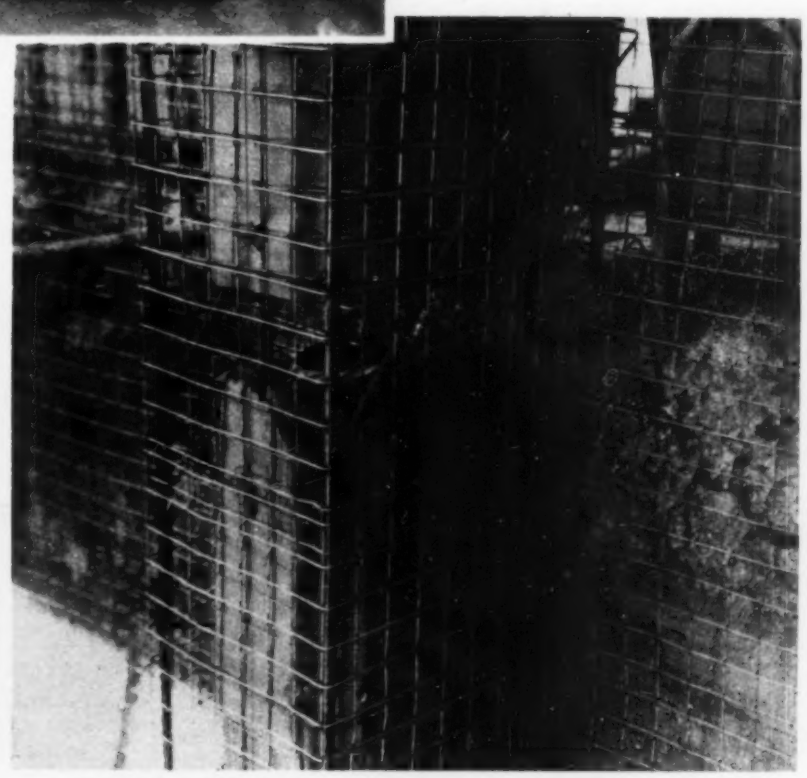
on all runways, one carpenter was detailed to constant inspection of the scaffold to make sure that it was as safe as a scaffold could be. As to the effectiveness of these precautions let it be noted that not one person on the street was ever hit or injured by falling materials, tools or debris.

Frequent and irregular shoe inspections prevented nail punctures among the workmen and kept fresh in their minds the idea of safety. Plenty of safety bulletins well placed throughout the job and an occasional personal letter from the superintendent placed on the bulletin board also helped to keep the men "safety conscious". Again results justified the efforts, as lost time accidents were kept to a very low number and of these only one might be classed as serious. There was no fatality on the job. A timekeper well trained in first-aid attended to all minor injuries on the job and gave first-aid treatment to all others.

Personnel—E. L. Mayberry was engineer-architect of the project with Allison & Allison, of Los Angeles, as consulting architects. Ralph J. Reed was consulting engineer for the owners. The Richards-Neustadt Construction Co. was the general contractor and in full charge of all work on the building. Through careful scheduling and with excellent cooperation from all the subcontractors on the job the work was finished three weeks ahead of the date set by the owners as the "dead line."



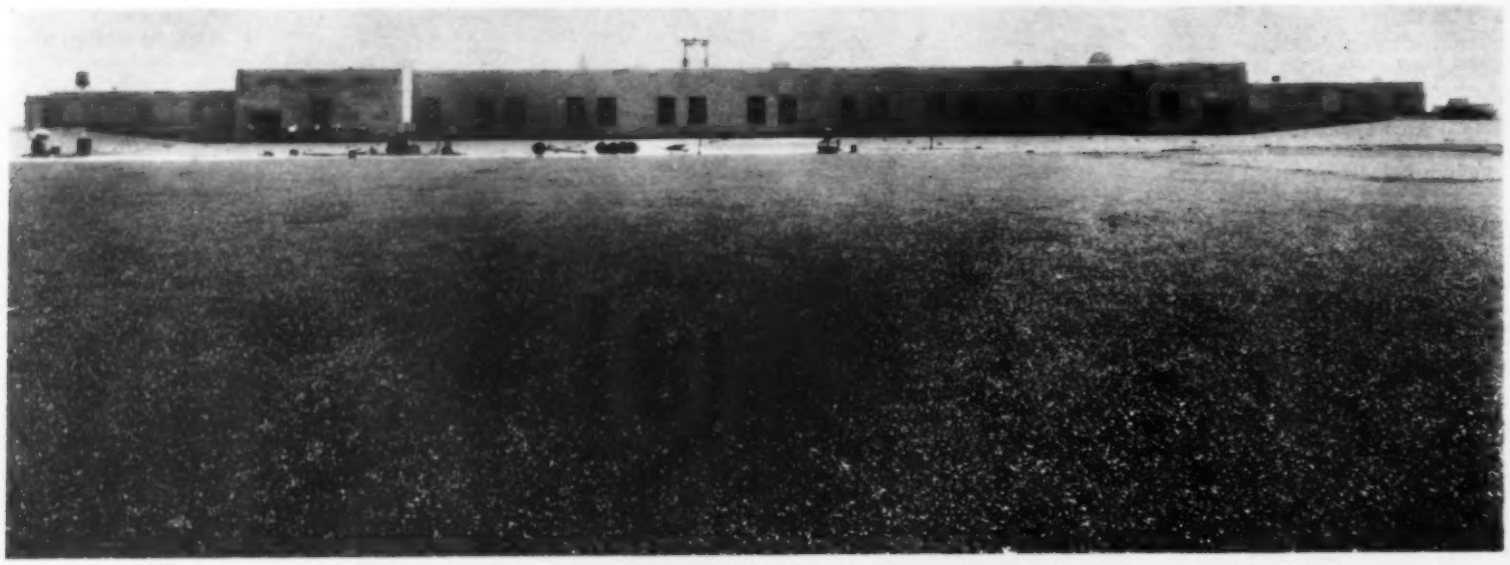
TILE SETTING OPERATIONS, illustrating rough surface of backing, bed coat for tile, bed coat facing and tile courses.



WELDED TRUSS in shell reinforcing for modernized exterior of Robinson department store building.

The pilasters and portions of the wall from the sidewalk to the third floor level are of terra cotta. This, too, was especially developed for this building by the same concern that made the tile. It differs from the ordinary terra cotta in that it has a thinner web section for the reduction of weight and has undercut fins on the back for mechanical bond. This facing was further mechanically bonded to the Gunite shell previous to the pouring of the terra cotta grouting by the use of ¼-in. round loops shot in with the Gunite and anchored behind the reinforcing. Through these loops are threaded ¼-in. round pencil rods and each piece of terra cotta is tied to these rods by a No. 7 galvanized wire. The sections of terra cotta were dowelled to each other with galvanized steel pins. After setting, the back of each section was filled with 1:5 grout.

Safety—From the first day to the last a ceaseless campaign of safety for the workmen and the public was waged by the contractor. Nothing was left undone that would add to the safety of the project. Beside the solid planking of every scaffold level and the 2-ft. guard



AIRPLANE LANDING DECK 300x350 ft. in area on roof of Philadelphia Post Office is surfaced with two courses of cold-laid asphaltic slag concrete utilizing new type of treated asphalt. Ramps at open ends of roof enable planes to take off at elevation 5 ft. above general level. Penthouses rise above landing deck along east and west edges of roof.

New-Type Cold-Laid Asphaltic Concrete

Paves Airplane Landing Deck on Roof of Philadelphia Post Office

AN AIRPLANE landing deck 300 x 350 ft. in area on the roof of the new Philadelphia Post Office provided the first commercial application of a new bituminous paving material described as inverted asphalt. The roof of the new post office is to be used by auto-gyros in transporting mail to and from the Camden, N. J., airport, saving about 90 min. in handling time over the present method of transfer. Architects and engineers of the Treasury Department accepted the new asphaltic paving material for use on the landing deck only after numerous laboratory and field tests had demonstrated the practicability, economy and durability of the new product.

Design of Deck—On the east and west sides, the airplane landing deck is bordered by one-story penthouses. At both the north and south ends of the roof, which are free from obstructions, the deck rises on a slope from a

FLOW COAT of new-type asphalt is applied to surface of concrete before first course of asphaltic concrete is placed. SMALL LAWN ROLLER *(inset)* compacts asphaltic concrete courses on post-office roof. Grover L. Adams, superintendent for Starrett Bros. & Eken, Inc., general contractor for building, sits in driver's seat.

point about 25 ft. back from the edge. These inclined runways enable planes to take off at an elevation about 5 ft. above roof level.

Paving Procedure—As built, the roof is twice waterproofed, once with membrane and again with the asphalt paving. On the structural concrete slab which forms the base of the roof, the contractor placed a ½-in. waterproofing membrane consisting of five plies of felt cemented and coated with pitch. Over this waterproofing layer was placed a 2-in. concrete protection slab.

Before applying the cold-laid asphaltic concrete to the protection slab, the contractor spread a flow coat of inverted asphalt over the surface for waterproofing purposes. The asphaltic material penetrated the crevices and pores of the concrete and served to seal any checks or cracks in the surface.

Two courses of asphaltic concrete, made with inverted asphalt and graduated sizes of slag aggregate, were placed and rolled to form a paved surface with a total depth of 2 in. The mixtures were produced in a twin pug mill about 12 mi. from the site and were delivered in open trucks to the building, where the material had to be transferred to wheelbarrows because the only equipment available for elevating it to the roof was an outside wheelbarrow hoist. On the roof, workmen dumped the wheelbarrows and spread the material to a depth of 1¼ in. for each of the two courses. This depth was compacted to 1 in. by rolling.

In the base course, the aggregate consisted of slag in sizes of ¾ in. to ¼ in. The finishing course utilized slag ranging in size from ¼ in. to dust, the percentage of fines being controlled to produce a thoroughly non-skid surface. Because the slag was dry, the pug-mill operator emptied several quarts of water into the aggregate for each 1-yd. batch before adding the cold asphalt. The slag was thoroughly coated with the inverted asphalt by the action of the twin pug mill.

COLD ASPHALTIC CONCRETE, made with slag aggregate and new type of material described as inverted asphalt, is distributed on roof in wheelbarrows and spread to depth of 1¼ in. before rolling.

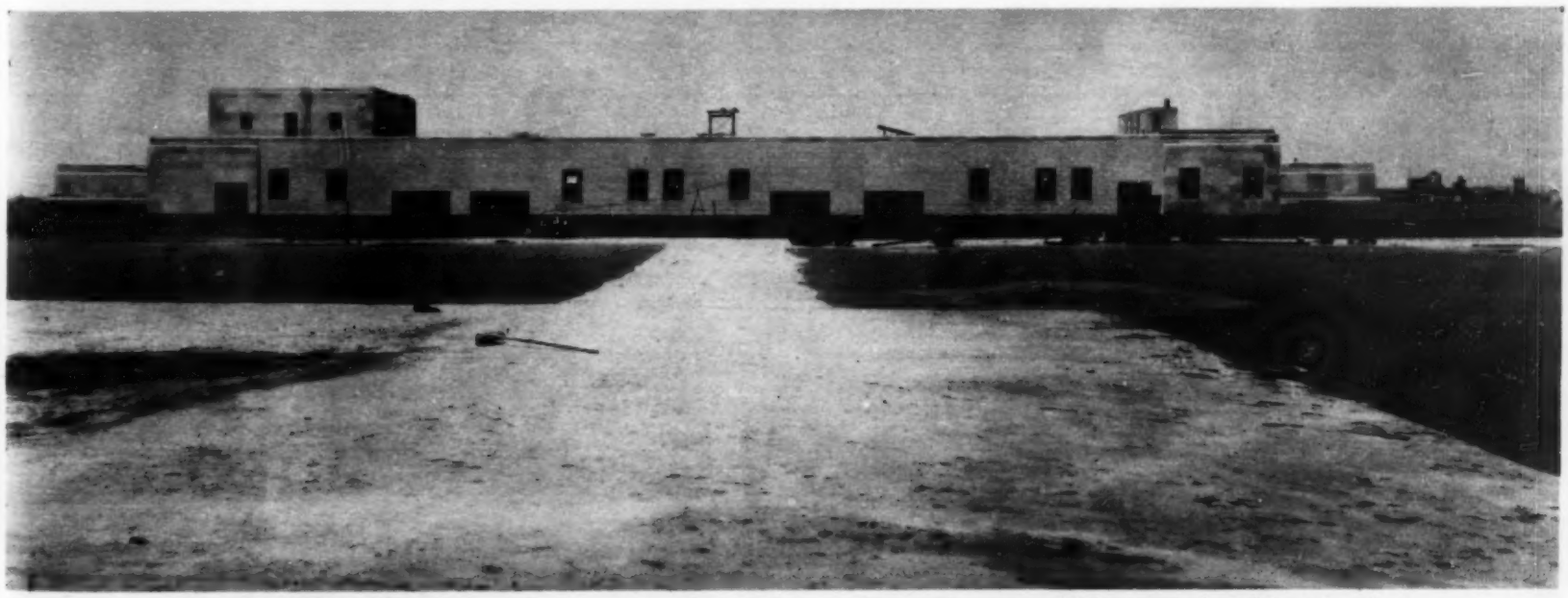
Inverted Asphalt—Asphaltic cement utilized in paving the roof deck had been treated by a new process developed by Dr. S. S. Sadtler, of Philadelphia. The name of the new product, inverted asphalt, is intended to describe the physical characteristics of the material. In non-technical language, it may be said that the water in the material is suspended in the asphalt, in contrast with the more usual combination, in which the asphalt is in suspension in the water.

To produce the new material, an asphalt cut-back is chemically treated at the refinery in such a way that after application the developed asphalt retains its original characteristics throughout the range of temperature and moisture conditions encountered during the twelve months of the year in any part of North America. It is claimed that inverted asphalt mixtures may be laid in rainy weather and thus remedy the seasonal nature of road construction in the United States, making highway work continuous throughout the year.

An asphalt treated by the new process can be applied to wet aggregates, without regard to the amount of water in the aggregate or on the road bed, and it can be laid at any temperature. The asphalt is mixed cold with crushed rock or other road metal in an ordinary twin pug mill. Inasmuch as heating and drying are entirely eliminated, a pug mill mounted on a trailer can be used, making it possible to save substantial freight and handling charges.

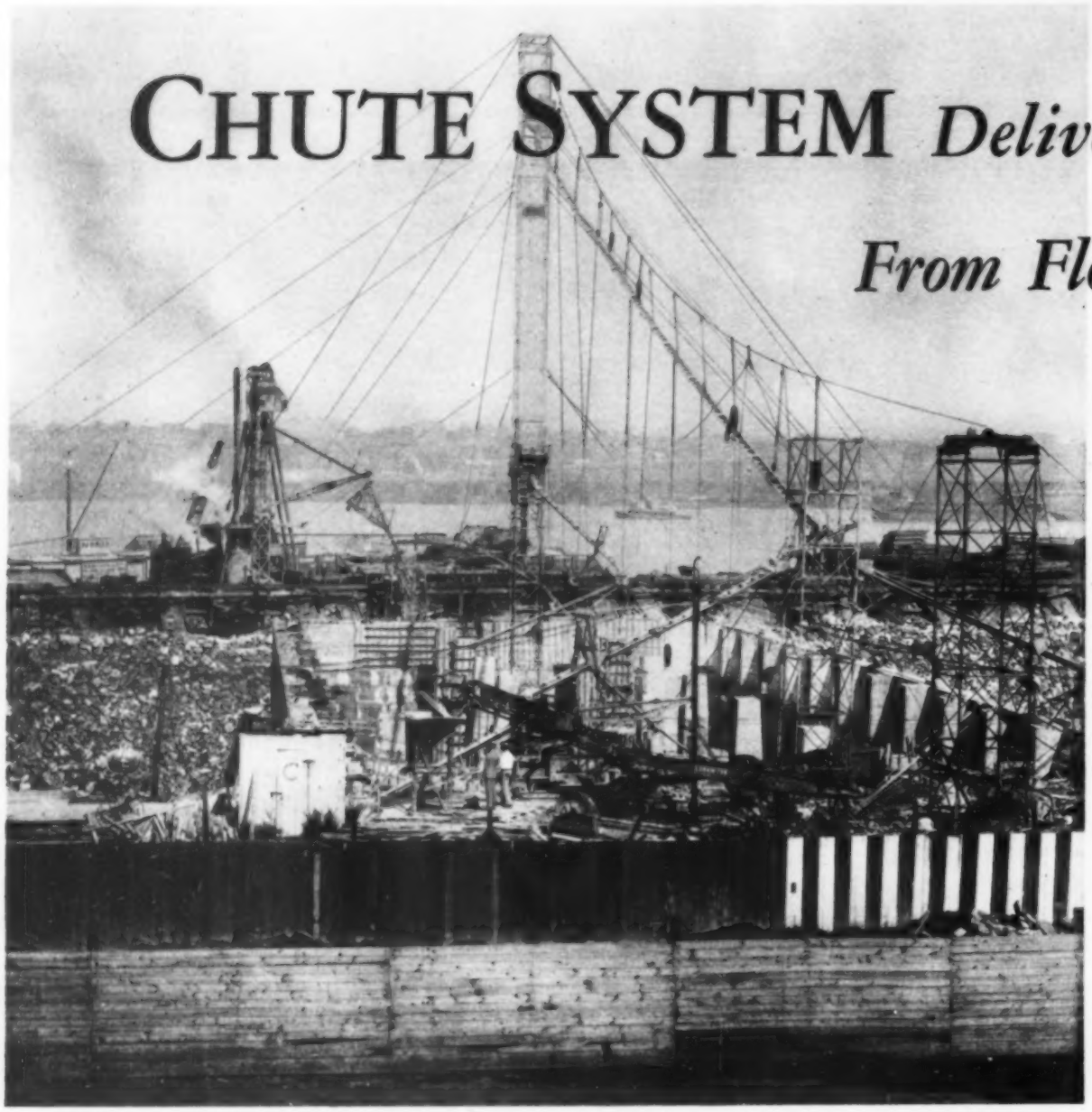
It is claimed that the chemicals present (as a result of inverting the asphalt) utilize all the water on the road metal as well as the contained water in the asphalt, thus eliminating all moisture and assuring complete covering of the aggregate with a waterproof asphaltic coating. Because the asphalt displaces not only the surface water on the aggregate but that contained in the pores as well, adhesion to the aggregate is said to be thorough and complete. As the material utilizes all surface water and moisture in the pores of the aggregate, and expels and repels any excess water present, it may be said to waterproof completely the asphaltic mixture. The inverting process waterproofs the asphalt itself, as the processed material will not mix with water or enter into suspension in it. Inverted asphalt for the Philadelphia Post Office was produced at a refinery of The Texas Co. Dr. S. S. Sadtler, inventor of the process, has applied for patents covering the new material. Except in Pennsylvania, where Dr. Sadtler retains the licensing rights, Jess Briegel, of New York City, is sole licensee for the United States.

The Philadelphia Post Office was designed and constructed by the U. S. Treasury Department, James A. Wetmore, supervising architect. Starrett Bros. & Eken, Inc., of New York City, executed the general contract for the building, with Grover L. Adams, superintendent, in charge at the site. The Warren-Ehret Co., Inc., of Philadelphia, was subcontractor for the roof.



PROGRESSIVE STAGES in process of paving airplane landing deck. In foreground, concrete slab has received partial coating of asphalt. In background, one course of asphaltic concrete has been placed and rolled and now is ready for second course to be laid.

CHUTE SYSTEM *Delivers Concrete From Floating Plant to Pier Walls*



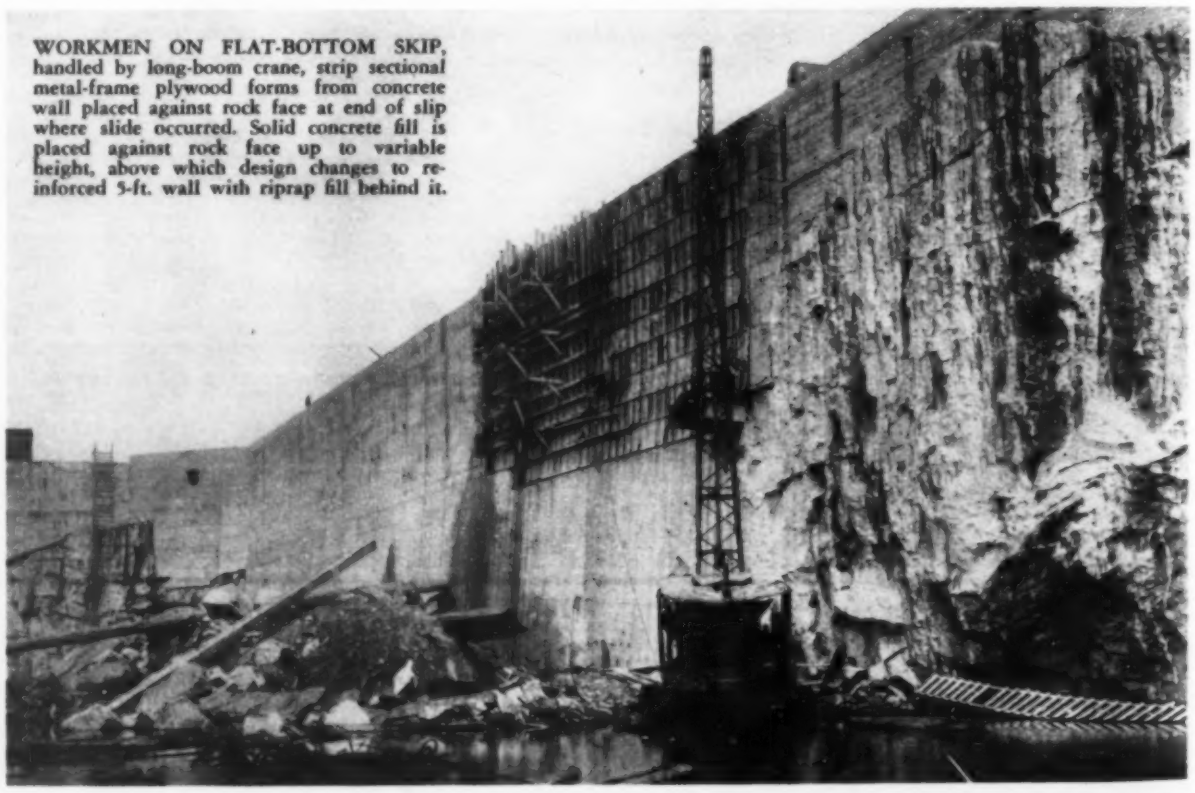
SYSTEM OF TOWERS AND CHUTES distributes concrete from floating mixing plant to pier wall forms. From 75-ft. tower on same hull with mixing plant, concrete passes through chute line to base of tower 187 ft. high inside area inclosed by pier walls. Chutes at two levels on this tower carry concrete either directly to final position or to subsidiary distributing towers.

A FLOATING mixing and hoisting plant with a tower-chute distributing system mixed and placed about 31,000 cu.yd. of a total of nearly 34,400 cu.yd. of concrete required in the construction of the pier and slip walls of those portions of New York City's three new 1,100-ft. piers which were built within a 15-acre area inclosed by a cofferdam between West 47th and West 52nd Sts., North River, Manhattan, described in *Construction Methods*, Sept., 1934, pp. 32-37. This cofferdam, of cellular steel sheetpile design, was constructed by the general contractor, Allen N. Spooner & Son, Inc., to permit excavation of rock and building of pier walls in the dry inshore from the 46-ft. rock contour. Beyond this contour, the pier design calls for a wood-pile substructure with a concrete deck. The piers were designed by the Department of Docks of the City of New York and the work was performed under the supervision of this department.

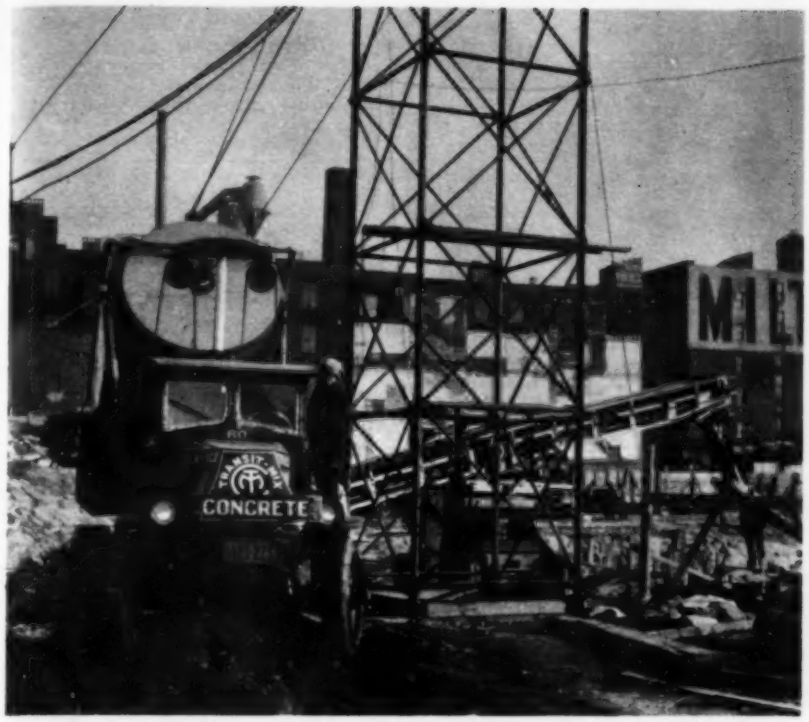
Economies in handling bargeloads of cement and aggregate and ease of moving a floating mixing plant offered decided advantages over a stationary land plant on this project. Tower chutes, permitted by the specifications, provided an economical and flexible method of transporting concrete from mixing plant to the forms, some of which were as much as 500 ft. from the nearest point at which the floating plant could be tied up. For walls at a greater distance, the contractor hauled concrete in truck mixers and placed part of it with the aid of portable belt conveyors.

Wall Design—Depth of the walls varies from about 10 to 56 ft. For the major part, the front face of the walls is vertical, and the back face is stepped 1½ ft. horizontally for each 4 ft. of vertical rise. At the top, which is at El. 8.82, the wall is 4 ft. wide. From the bottom up to El. —1, the wall is constructed of cyclopean masonry consisting of 1:2½:5 concrete containing derrick stones. Above El. —1, the design calls for straight 1:2:4 concrete.

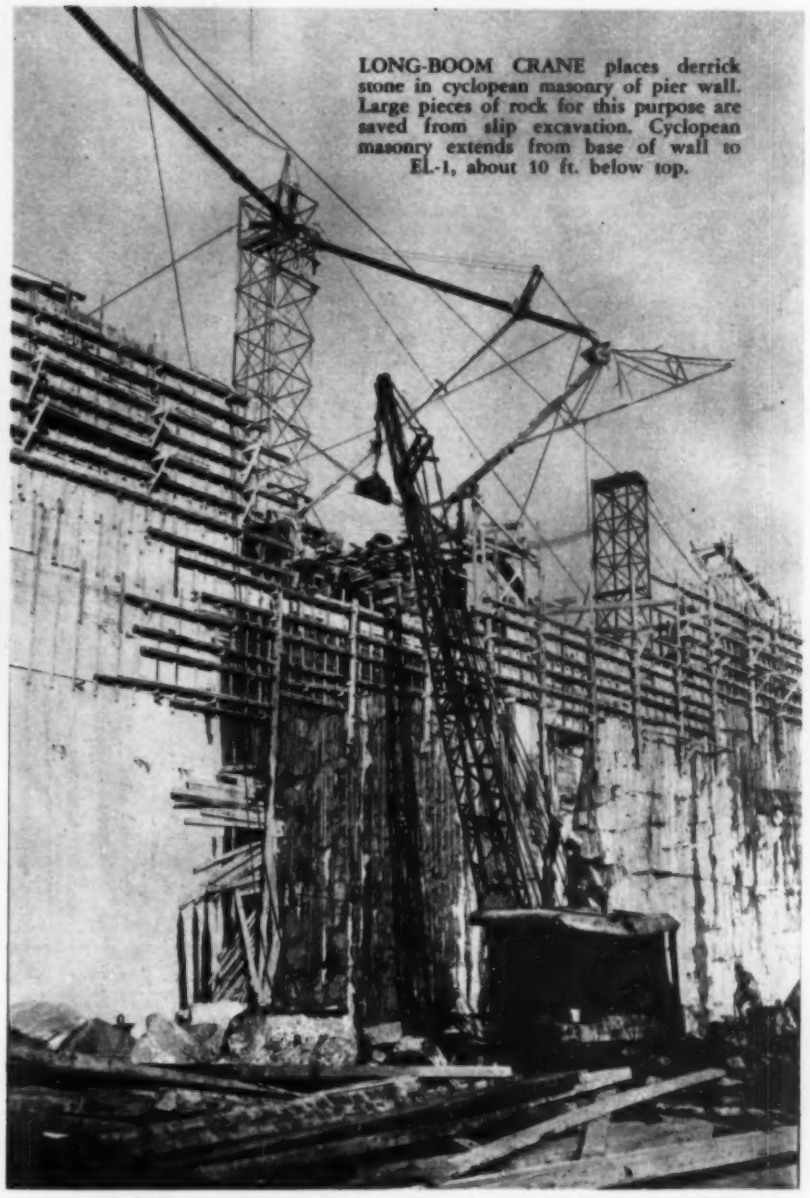
Plant Layout—In general, the concreting procedure consisted of an-



WORKMEN ON FLAT-BOTTOM SKIP, handled by long-boom crane, strip sectional metal-frame plywood forms from concrete wall placed against rock face at end of slip where slide occurred. Solid concrete fill is placed against rock face up to variable height, above which design changes to reinforced 5-ft. wall with riprap fill behind it.



TRACTOR-MOUNTED BELT CONVEYOR places central-mixed concrete delivered from floating plant by truck mixer.



LONG-BOOM CRANE places derrick stone in cyclopean masonry of pier wall. Large pieces of rock for this purpose are saved from slip excavation. Cyclopean masonry extends from base of wall to EL.-1, about 10 ft. below top.

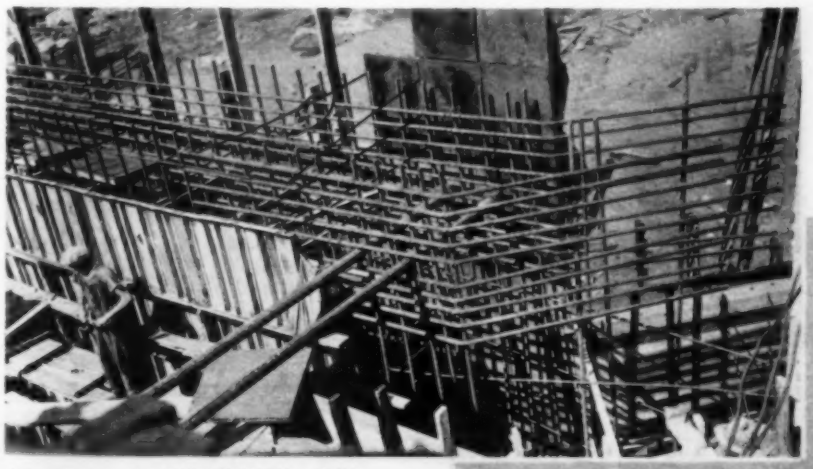
choring the mixing plant outside the cofferdam approximately on the center line of each pier. The floating plant passed concrete over the cofferdam by means of a hoist tower and a chute line which discharged into a second hoist tower inside the pier area. From this tower, which elevated the concrete to a considerable height, chute lines took off at two levels to deliver the concrete to the forms.

Half of a car float provided a substantial hull for the complete batching, mixing and hoisting equipment of the floating plant. The plant was steam operated throughout. One 150-hp. vertical boiler drove five engines and a pump, and an Ohio steam locomotive crane, anchored down to the after-deck, handled sand and stone with a 1-yd. Hayward clamshell bucket on a 70-ft. boom from barges into steel bins with 45-cu.yd. compartments.

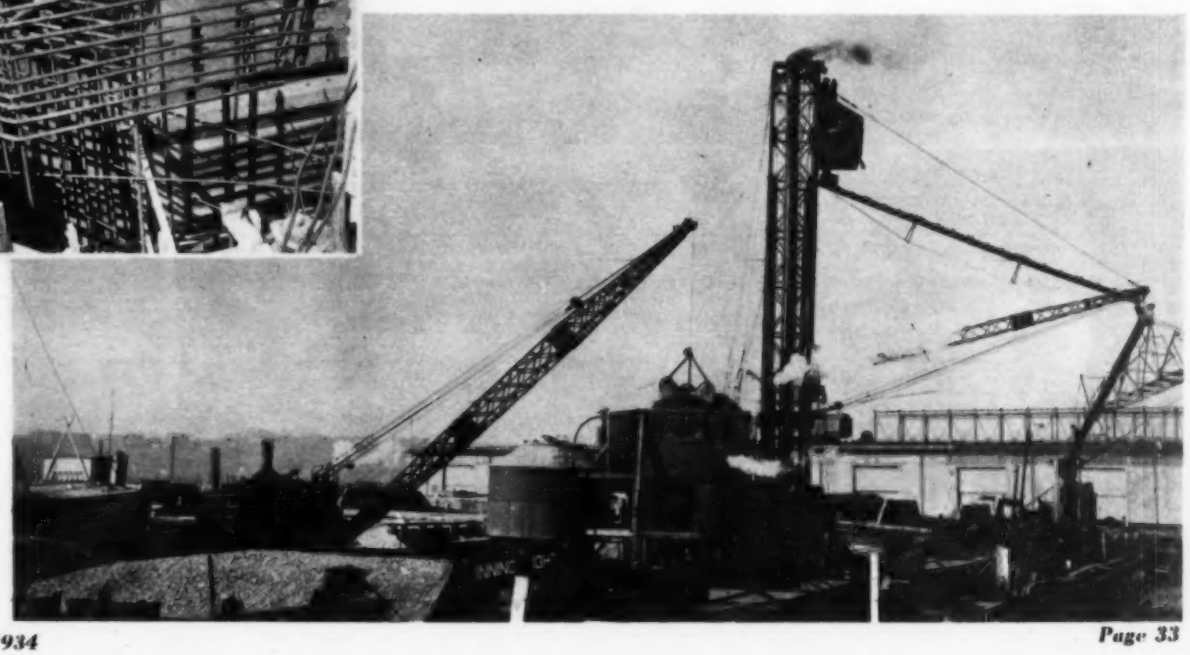
Cement was delivered to the site in special bulk-cement barges, rented for the purpose by the cement companies, and was pumped into a 600-bbl. Blaw-Knox steel tank on board the floating plant by a Fuller-Kinyon conveying system. From this tank the cement was elevated by vertical screw conveyor to a horizontal V-shaped tank, whence it was delivered by horizontal screw feed to a Blaw-Knox cement-weighing device. Sand and stone from the overhead bins were weighed in Blaw-Knox batchers.

A 1-yd. Ransome mixer mixed each batch 1 min. and discharged into a bucket at the base of the 75-ft. hoist tower. A Lidgerwood hoist raised the bucket, which discharged into a tower hopper feeding a 48-ft. section of boom chute. At the end of the boom chute was hung a 48-ft. section of counterweighted chute. The tower hoist, the mixer, and the vertical and horizontal cement screws, as well as one deck engine, were driven by the 150-hp. vertical boiler. When running two 8-hr. shifts per day during the concreting of piers 88 and 90, this plant produced an average of 600 to 700 yd. in 16 hr.

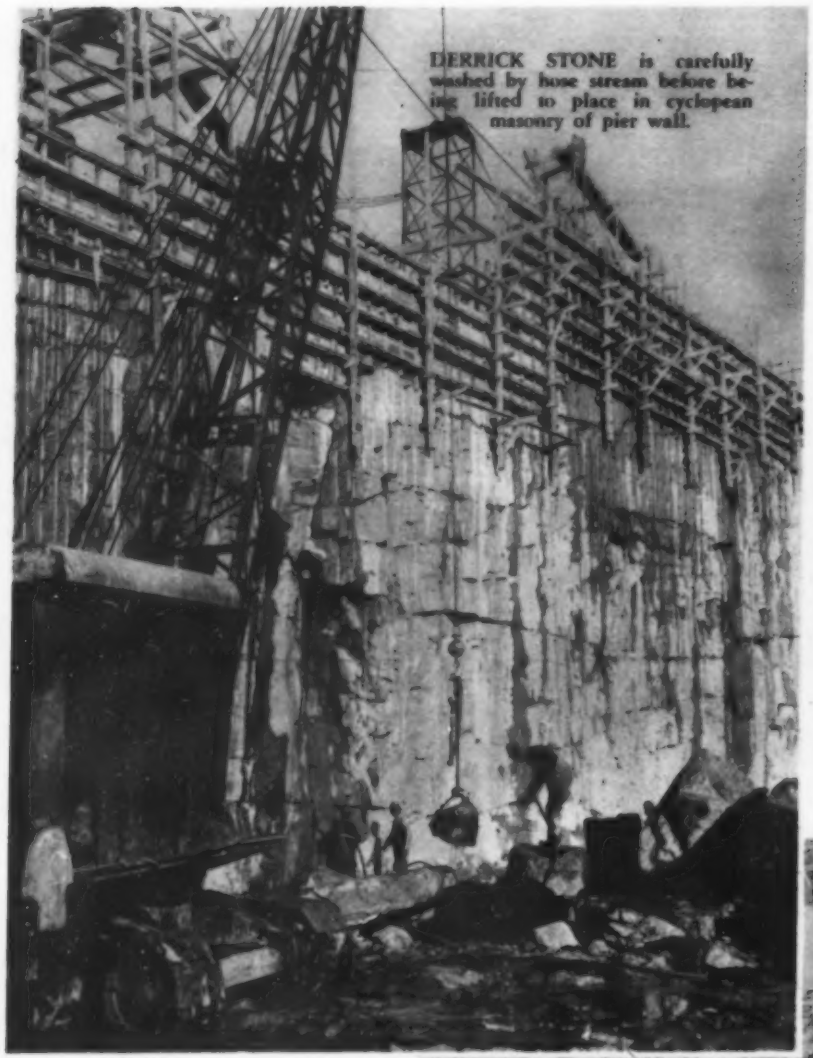
Distributing System—From the hoist-



AT TOP OF REINFORCED SLIP WALL, structure is tied by pairs of 3-in. rods 50 ft. long, at intervals of 25 ft. At inshore end rods are anchored to grillage of three vertical beams set 8 ft. into solid rock and cast in concrete. Tierods are incased monolithically with wall.



FLOATING CONCRETE PLANT *(right)* is served by steam locomotive crane anchored down to afterdeck of hull and by pipe line from special bulk-cement barge partially visible at left of photograph. Plant is operated entirely by steam.



DERRICK STONE is carefully washed by hose stream before being lifted to place in cyclopean masonry of pier wall.

TRUCK MIXER, charged from hopper erected over I-beam runway on cofferdam, transports concrete to wall sections outside range of chute system.

ing tower on the floating plant, the concrete passed through chutes to the base of a tower 187 ft. high inside the area formed by the pier walls. This tower was equipped with two hoppers and chute lines to deliver concrete at various distances from the tower. The longer chute line, which was carried by a suspension cable, delivered to shorter chutes on distribution towers, as illustrated by an accompanying photograph.

For the slip wall between piers 88 and 90, which was at too great a distance from the cofferdam to permit distribution from the floating plant by means of towers and chutes, the contractor purchased about 3,000 yd. of Transit-Mix concrete. This concrete was placed principally by chutes directly from the trucks. A smaller quantity of concrete was distributed on the job by rented 5-yd. Transit mixers. These mixers were charged by a spout from an elevated hopper, set up over a truck runway on the cofferdam, to which the floating plant delivered concrete by chutes. A portable 40-ft. belt conveyor of the Conveying Weigher Co., mounted on a tractor, placed part of the truck-delivered concrete in the forms.

Cyclopean Masonry — Large stones suitable for use in the cyclopean masonry of the walls were saved from the general slip excavations. These stones were thoroughly washed with a hose and were deposited in the concrete by long-boom crawler cranes, as illustrated by photograph. Specifications provided that the derrick stones must be covered by a veneer of at least 6 in. of 1:2½:5 concrete between the stones and the surface of the wall.

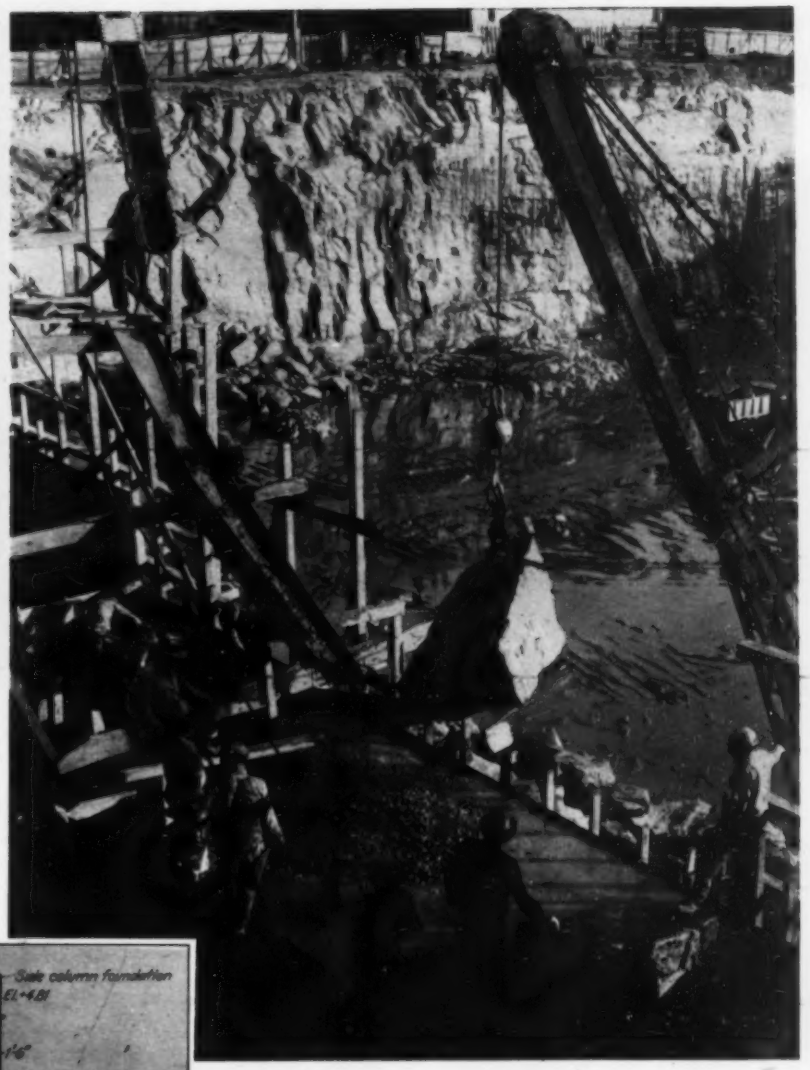
Wall Forms — Forms for the construction of the walls were of two types: Sectional wood forms in large panels and small sectional metal frames of patented Universal design faced with plywood. The contractor used about 5,000 sq.ft. of the sectional metal-frame forms on the high straight sections of slip walls between the piers. This type of form has the advantage of a plywood lining which can be renewed

SECTIONAL FORMS OF PLYWOOD attached to metal frames are erected at end of slip where slide has occurred. Workmen install heavy dowels in rock face.

PORTABLE CEMENT UNLOADER *(below)* on bulk-cement barge is operated by electric power produced on board. Diesel-generator set provides current for this unit and for rotary compressor supplying air under pressure to cement line leading to mixer barge.

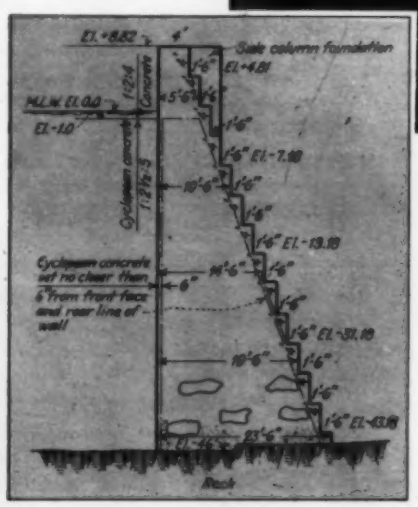
HEAVY TIMBER WALES AND SHORES support metal-frame sectional plywood forms for 38-ft. bottom lift of slip wall, to be concreted monolithically to this height. Key trench 3 ft. deep anchors wall at base. Truck mixer at top of bank is delivering transit-mix concrete from permanent commercial plant in city.

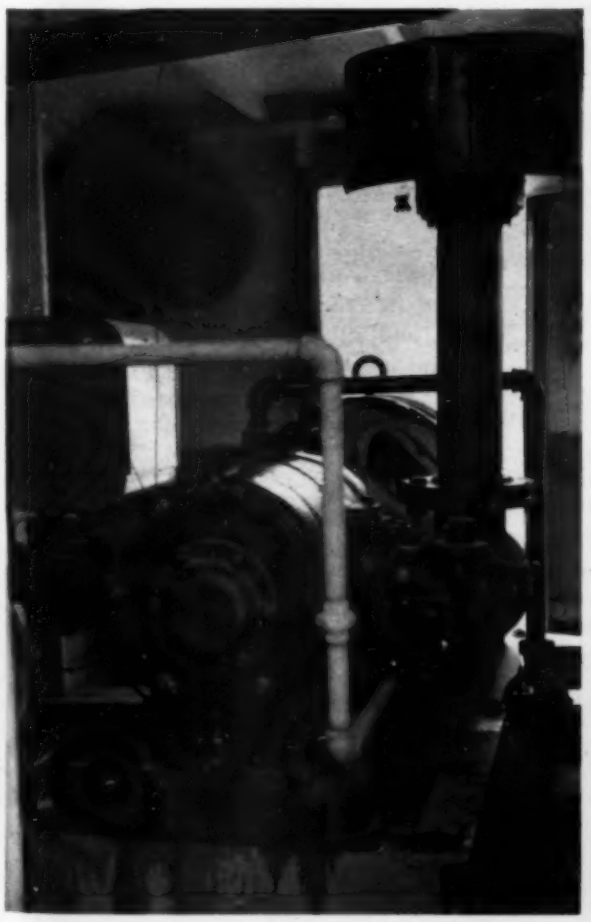
easily. Each form panel, 2x3 ft. in size, consisted of a rectangular frame of steel angles with two angle stiffeners. Application of the forms was particularly successful on high, straight walls, some of which were concreted in continuous pours up to heights of 40 ft. To brace forms of this depth, the contractor used 12x12-in. timber uprights and 12x12-in. timber wales braced by 12x12-in. inclined timber rakers, anchored at the lower end by 24-in. steel girders lodged against dowels in the foundation rock and against large piles of heavy stones.



CYCLOPEAN MASONRY of pier wall *(above)* is composed of large derrick stones and 1:2½:5 concrete delivered from floating plant by long chute line.

SECTIONAL ELEVATION *(right)* of pier wall built up from rock at El.-46. Where conditions require it, back of wall is changed to unbroken sloping line.





ROTARY COMPRESSOR on bulk cement barge supplies air under pressure to portable cement unloader, where air mixes with cement to provide fluid condition in conveying line.

Administration — For the Department of Docks, under John McKenzie, commissioner, and F. T. O'Keefe, chief engineer, all work in the field was directed by A. J. Duggan, resident engineer. Operations of Allen N. Spooner & Son, Inc., were under the general direction of F. R. W. Cleverdon and Ray N. Spooner. W. A. Morton was superindent in charge of the project for the contractor.

PIER WALL consists of combination of sound rock and concrete. Rock overburden is removed where necessary until solid rock is uncovered to provide satisfactory foundation for gravity-type wall indicated in sectional drawing *(above)*.

A tough job

Big or little, these rocks go where the boss says . . . with the A-C Model "L" on the job. The double drum winch is used for heavy pulling and land clearing.

• •

Some 750,000 cu. yd. of rock will be needed . . . so a Model "K" and bulldozer spread the pile to increase storage capacity. The conveyor connects a secondary crusher (right) with the primary crusher — an Allis-Chalmers 42" Gyratory.

. . . Tractors Work 22 Hours a Day to Rush Progress of Huge Norris Dam

A $34,000,000 project . . . 250 feet high . . . a crest length of 1800 feet . . . containing a million cubic yards of concrete . . . with a storage capacity of 2,500,000 acre feet . . . creating a lake of more than 100 square miles, with a shore line of 800 miles, that will store a year's flow of the river above . . . Begun slightly more than a year ago . . . scheduled for completion by the end of 1935 . . . This, briefly, is the amazing story of Norris Dam . . . one of the six largest concrete dams ever built . . . which is headed for completion in the record time of 2½ years. So well have equipment, materials, handling and labor been dove-tailed together . . . the job is well ahead of schedule. Tractors are required to work 22 hours a day . . . in rock . . . under the toughest conditions. To withstand this grueling pace, Allis-Chalmers equipment was selected . . . four Model "L" tractors, a Model "K", and an A-C No. 10 Grader . . . rugged machinery that can be relied on to help the men of TVA provide low cost power for 6,000,000 people.

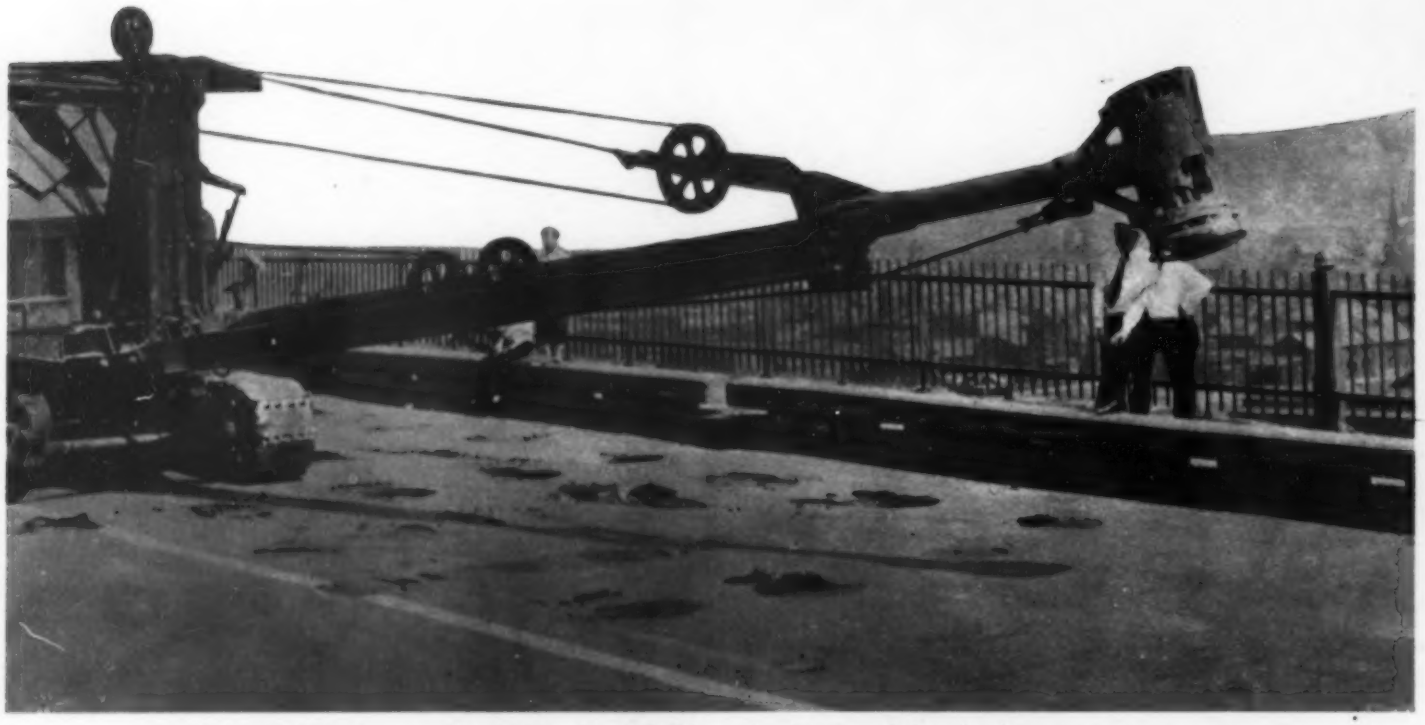
• •

ON YOUR JOB — In these days of stiff competition, the contractor with an up-to-date outfit . . . who knows his costs . . . gets the business. Delays and lost yardages due to the wrong kind of equipment are costly . . . often fatal. It will pay you to let Allis-Chalmers equipment help lower your costs — track-type tractors, wheel-type tractors, power and hand controlled blade graders, elevating graders, Speed Patrol graders, track wagons, wagon tracks.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

OOKING UPSTREAM — The cof-erdam and foundation of the Norris Dam, located on Clinch River which uns into the Tennessee, are in the mmediate foreground. An overhead able system will handle the placing f concrete and materials.

MORE BULLDOZING — Under adverse conditions . . . working long hours . . . then it is that A-C "More Value" features and quality materials demonstrate their superiority. At right — A-C Model "K" and bulldozer. Below — Model "L".



SHOVEL HAMMER on short handle hinged to end of boom breaks up asphalt-surfaced concrete pavement. At each spot on pavement, hammer is dropped four to six times from height of 6 to 8 ft.

SHOVEL HAMMER

Breaks Up Asphalt-Covered Concrete

DEMOLISHED AND READY TO LOAD after passage of shovel hammer. Asphalt cushion 2 to 5 in. thick does not seriously reduce effectiveness of hammer.

IN EARLY STAGE OF WORK, dipper shovel breaks up and loads old pavement. Large fragments prove difficult to handle.

CONTRACTORS who figured recently on the job of repaving the Boulevard of the Allies, in Pittsburgh, assumed that the old concrete was cracked and of such low strength that a power shovel could readily dig and remove it. The pavement, about 15 years old and 38 to 41 ft. wide from curb to curb, consisted of asphalt from 2 to 5 in. thick over 8-in. concrete slab, not reinforced, resting directly on shale and clay-shale subgrade.

After the contract had been awarded to the Harrison Construction Co., of Pittsburgh, this concern put on the job a 1¼-yd. shovel to remove the old pavement. It was found that the concrete slab broke along fissures, cracks, and planes of weakness into pieces of irregular size and shape. As the average

area of the pieces was perhaps 3 sq.yd., a large proportion of them could not immediately be loaded with the dipper. To reduce them in size, the shovel worked up a heavy breast of material in front of the dipper. In the process of crowding forward, striking large pieces with the heel of the bucket, and turning over this mass, the larger pieces gradually were broken to loading size. By this method it was possible to load only from 20 to 30 lin. ft. of half-width pavement per hour, and the shovel was subjected to such severe racking strains that clutches and other wearing parts began to show the effects.

Hammer Operation—Consideration then was given to the employment of pneumatic drills and blasting. Finally the possibility of breaking the concrete by hammer action, which previously had been rejected because it was thought the asphalt cushion would render the hammer blows ineffective, was reconsidered and given a trial. A Keystone 1-yd. revolving shovel, equipped with a 3,000-lb. hammer, was put on the job. The hammer was rigidly attached to a short handle, or stick, which was hinged to the end of the shovel boom and operated in a manner very similar to the keystone trench digger or pull-scoop shovel, the same boom being employed for both, as well as for the plunger or skimmer bucket.

With the hammer, a row of five shallow depressions or "spots" was struck across the half-width of pavement; the shovel then moved forward about 5 ft. to strike another row of "spots". The spots were spaced 2½ to 3 ft. apart transversely and about 5 ft. apart longitudinally. After a little experimenting, a hammer drop of 6 to 8 ft. was chosen in preference to a longer one, as the shorter drop produced sufficient impact to fracture the concrete with four to six blows in each spot, depending on the thickness and softness of the asphalt surface. An average of twelve to fourteen strokes was delivered per minute.

Records kept over a period of 54 hr. gross operating time, 44 hr. net, showed hammer production of 155 sq.yd. and 190 sq.yd. per hour respectively. The asphalt surface retarded the operation by cushioning the blows and by concealing from view the cracks made in the concrete. This handicap proved much less serious than had been expected.

APPLICATION OF SHOVEL HAMMER to operation of breaking old pavement increases speed of demolition and reduces size of fragments for easier loading.

Loading hammered material reduced wear on the shovel to normal for earth excavation. The broken pieces were much smaller, and about half of the material was reduced to aggregate size. Shovel output was doubled.

Plunger Shovel—As the hammer was some distance ahead of the shovel and as the latter needed repairs, it was decided to replace the hammer with a 1¼-yd. Keystone plunger bucket of the skimmer type, to see how it would compare in efficiency with the dipper shovel. Less than 2 hr. was required for the change.

In its first hour the plunger loaded 27 trucks, as against an average of 14½ trucks with the dipper shovel. The same fleet of 12 trucks served the plunger, disposing of the spoil at the same place on Sawmill Run Boulevard, about 3 mi. distant. When working with the dipper shovel, the trucks lost some time waiting to be loaded. The plunger not only kept pace with the truck supply, but had 10 min. waiting time due to truck shortage in the first hour.

To a large extent the side guards of the plunger bucket had the effect of shearing the concrete slab to bucket size, making it enter more readily. The plunger bucket, being long and low, filled easily and dumped quickly, with little sticking of material. These characteristics of the skimmer helped to step up the best previous loading record by about 40%. The plunger left an accurate, clean and hard subgrade behind it.

SKIMMER BUCKET *(left)*, substituted for hammer attachment, loads broken pavement easily and quickly and trims subgrade close to desired elevation and profile.

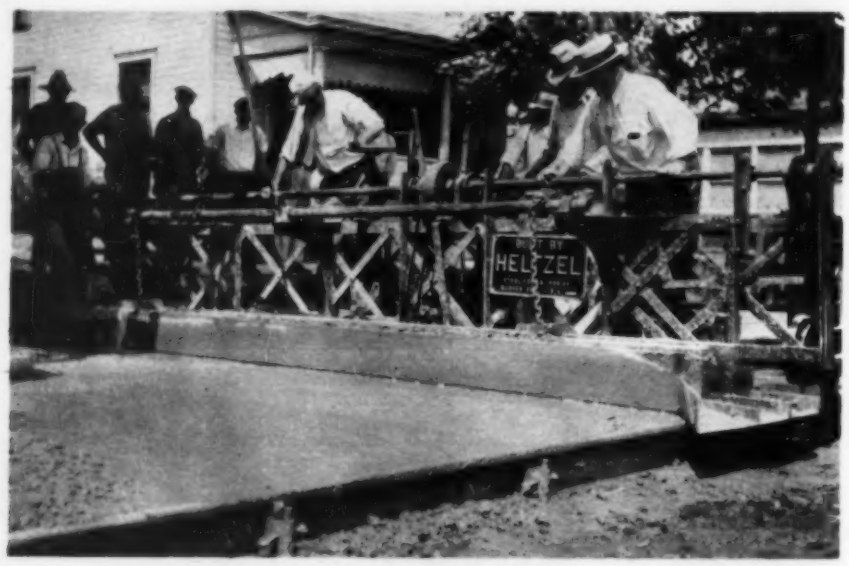
Getting Down to DETAILS

[Close-up Shots of Job Methods and Equipment]

TIMBER VIADUCT of creosoted prefabricated members with reinforced-concrete deck slab resting on dapped wooden stringers carries Oregon highway across ravine in Portland, where two of these structures, about 400 ft. long and 100 ft. high, have been built under direction of C. B. McCullough, assistant state highway engineer. Deck is supported by series of towers, each consisting of two three-column bents. Columns have I-section, built up of four 8x14-in. timber posts (two in each flange) connected by web system of 4x12-in. planks. Joints are strengthened by steel gusset plates.

POWER SHOVEL TEARS UP TRACKS *(left)*, one rail at a time, by means of yoke and roller device hung by chain from dipper, preparatory to repaving street in Auburn, N. Y. As shovel travels backward, rail is torn loose from connections and raised clear of pavement. After removing rails, shovel returns to dig out old brick and macadam Brayer Bros., of Auburn, contractors.

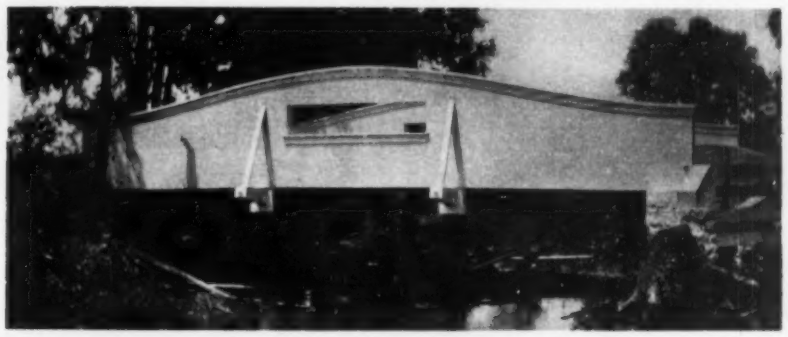
HIGH-VOLTAGE TESTER locates pinholes in bitumastic enamel lining of flood release outlet pipes at Morris Dam (formerly Pine Canyon Dam) being built by Bent Bros., Inc., Winston Bros. Co. and W. C. Crowell, joint holders of contract, for Water Department of Pasadena, Calif., S. B. Morris, superintendent and chief engineer, to provide a storage reservoir for municipal supply on San Gabriel River.



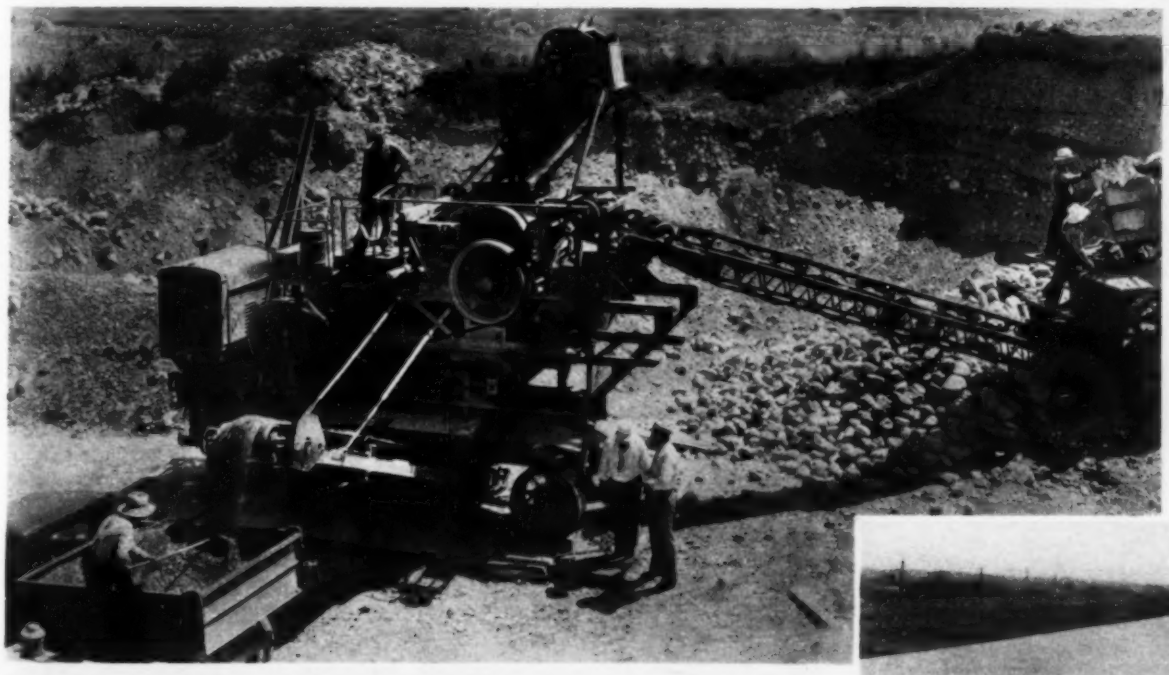
TWO-DIRECTION FINISHING MACHINE operates with screed in contact with pavement on both forward and backward movements. First pass with Flex-Plane machine is made forward, as usual. On reverse pass, screed carries sufficient concrete to fill all voids, eliminating labor of transporting concrete in shovels to fill scored spots, as necessary heretofore. Machine finishes 32- and 36-ft. pavement on U. S. 30 at Minerva, Ohio, under direction of H. J. Wright, superintendent for Ohio Department of Highways.

TRAVELING BOLTING CARRIAGE developed by Mason & Hanger Co., Inc., general contractor, for use in Port of New York Authority's Midtown Hudson vehicular tunnel under Hudson River is erected above ground for preliminary test inside section of cast-iron tunnel rings near New Jersey shaft. Apparatus supports working platforms around inner periphery of 31-ft.-diam. iron lining. Wooden facsimile of erector arm gives clearances for test.

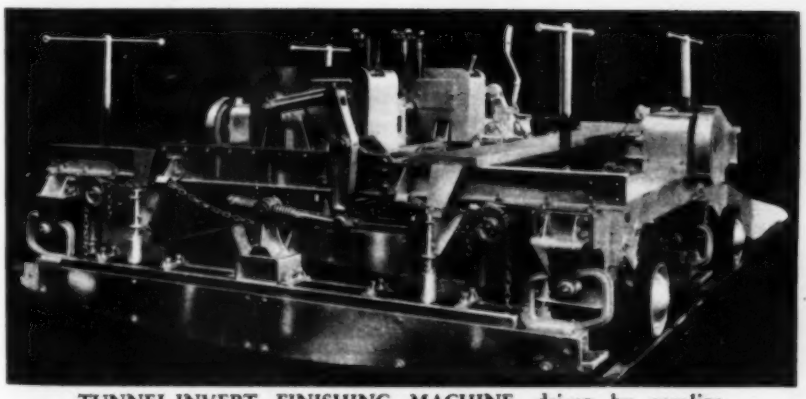
COMPOUND MULTI-PLY TIMBER TRUSS *(above)* is used in 40-ft.-span bridge *(below)* on county road 3 mi. north of Sidney, Ohio. New truss design, developed by H. L. and C. F. Loudenback, of Sidney, is made up of alternate layers of sheathing and timber-truss assemblies glued, nailed and bolted into a single solid unit. Truss has been placed on deck of old iron-truss structure, which is to be replaced by new bridge.



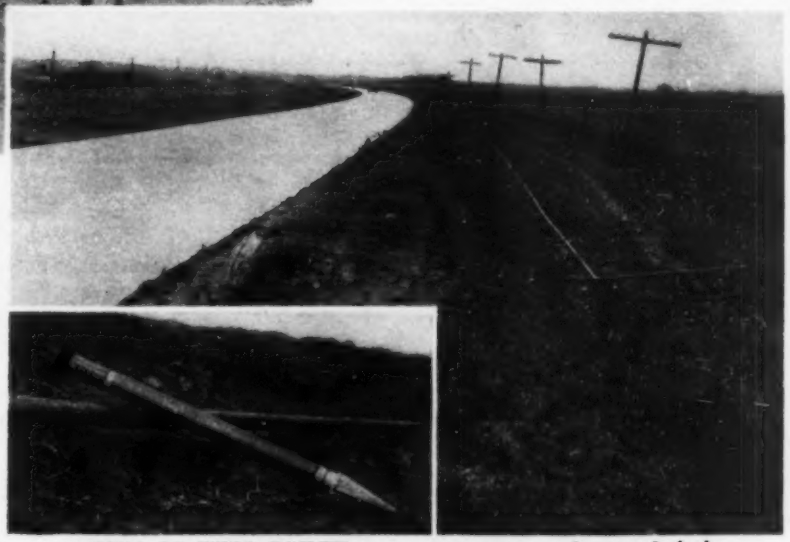
NEW TIMBER-TRUSS BRIDGE. By placing new trusses on existing abutments outside old trusses and building new structure around old, traffic is held up only 8 hr. while old bridge is removed. Span is given added rigidity by special framing details connecting floor beams to trusses and by deck of double diagonal sub-flooring, on which is placed wearing surface of asphalt bridge plank. Zinc cap covers trusses, and all lumber is chemically treated. Capacity of trusses can be increased while bridge is in service by adding layers of truss members and sheathing.



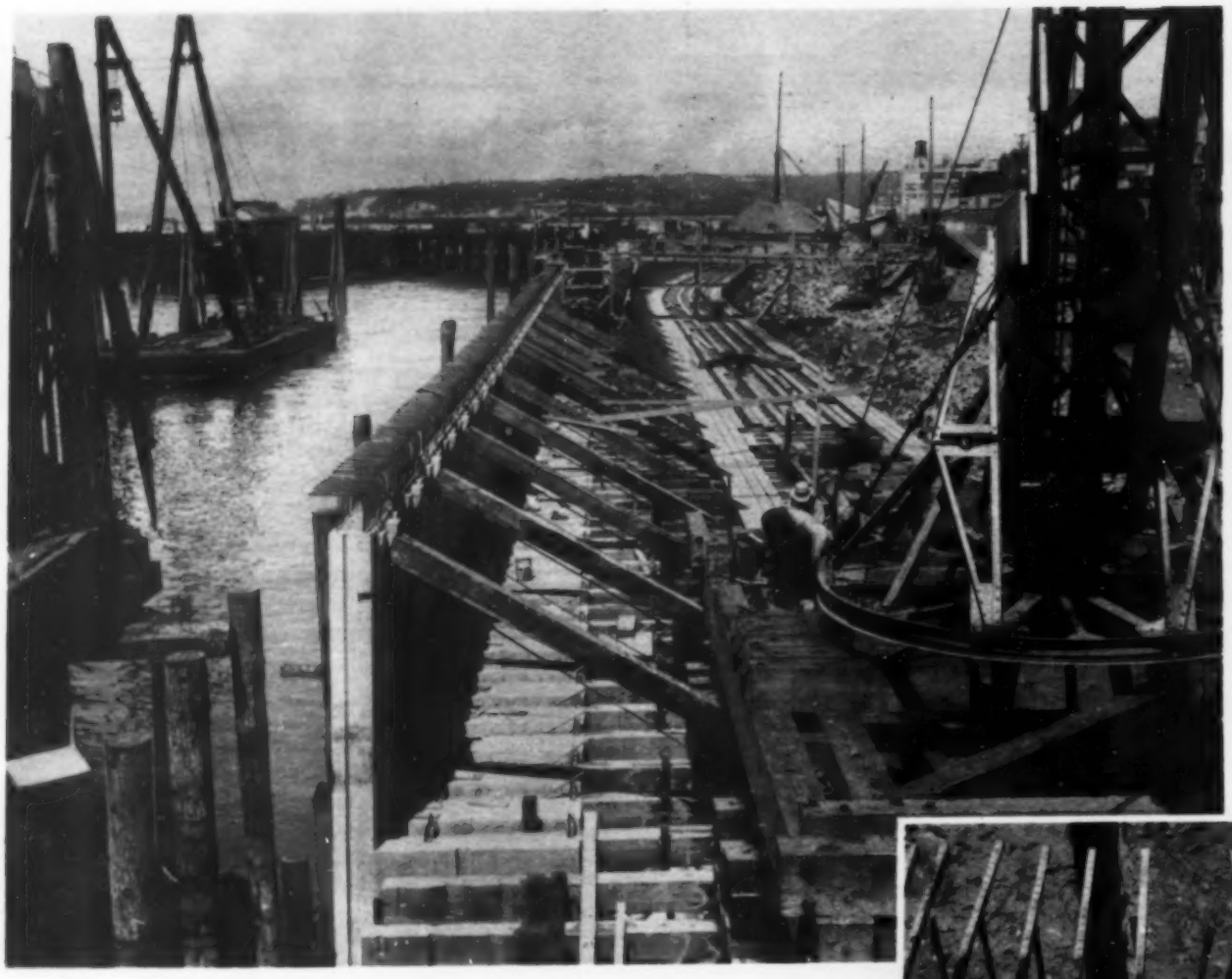
PORTABLE TWO-CRUSHER SCREENING AND CRUSHING PLANT *(left)*, mounted on rubber-tired wheels, serves Jaeger Bros., of West Bend, Wis., in reducing gravel containing large proportion of boulders. Pioneer plant has 40-ft. swivel-type feeder conveyor with shovel hopper and plate feeder. Built into compact plant are double-deck shaker screen, jaw crusher, roll reduction crusher, and 20-ft. delivery conveyor, all driven by 80-hp. gasoline motor.



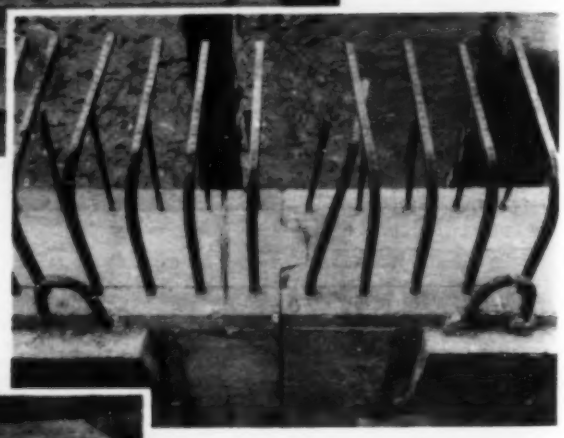
TUNNEL-INVERT FINISHING MACHINE, driven by gasoline-electric power, for use by Dravo Contracting Co., of Pittsburgh, in Val Verde tunnel of Colorado River aqueduct being built by Metropolitan Water District of Southern California, is adapted from Blaw-Knox road finisher of same type. Adaptation required concave screeds hung from frame (to function without use of forms), rubber tired wheels to prevent fracture of concrete ledge, and precise steering by automatic brakes on traction motors—one motor for each end truck.



SYSTEM OF WELL POINTS corrects pavement settlement. Jacked under concrete pavement and connected to header fed from tank truck series of perforated pipes restores moisture to dry subgrade and raises slab to original grade and crown. Kansas State Highway Department experiments successfully with this process in leveling distorted concrete slabs resting on certain kinds of soils. Pipes are installed in driest soil, 7 to 10 in. under pavement and 5 to 10 ft. apart. Water is fed into soil for number of days, until subgrade approaches saturation point.



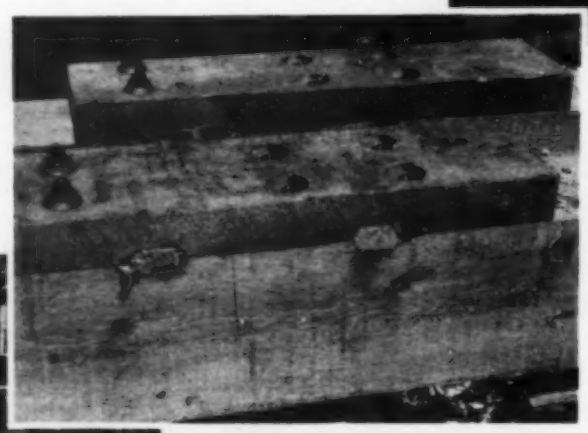
PRECAST CONCRETE SLABS *(left)* **in place supported by temporary shores and ties. Projecting reinforcing will carry sidewalk.**



JOINT BETWEEN SLABS *(below)* **on top of wall. U-bolts for vertical lift have to be offset slightly. Projecting reinforcing is for sidewalk to be cast in place.**

Precast Seawall Slabs

Rest on Wood-Pile Relieving Platform



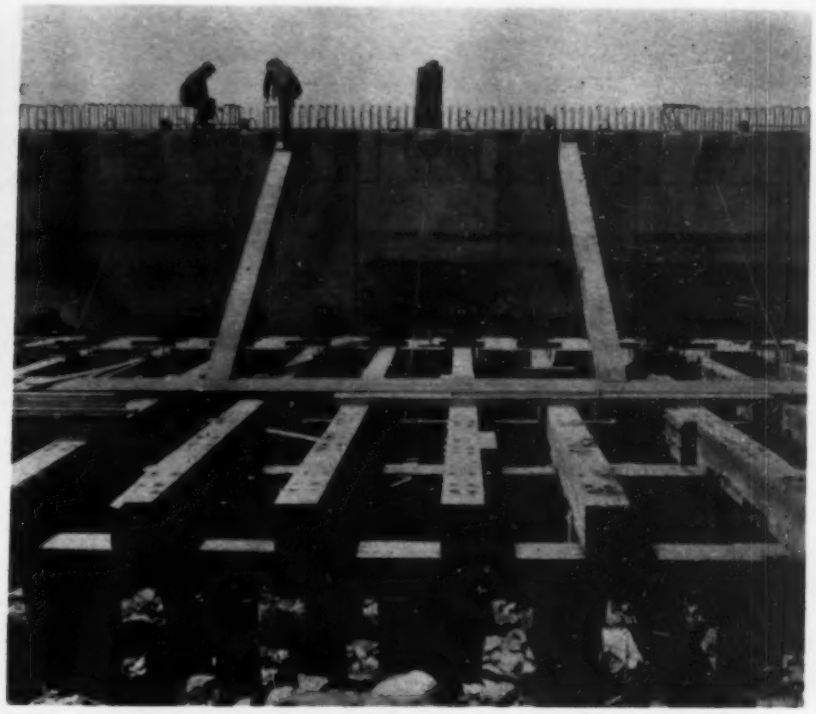
CEMENT MORTAR KEYS are installed between 12 x 14-in. timber caps and 4x12-in. scabs.

BATTER PILES are cut off to exact grade, their locations are then surveyed and each cap is fitted to its supporting piles.

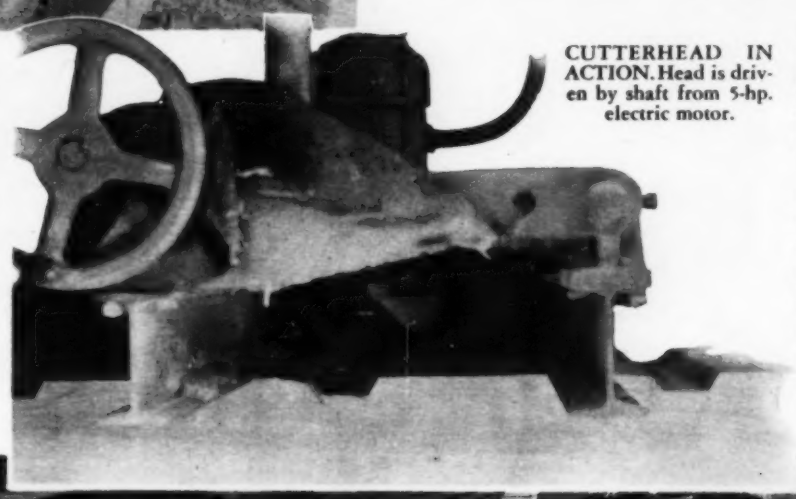
A SEAWALL of novel design, now under construction in Seattle, will provide more than a mile of the most valuable part of the city's waterfront with a modern concrete structure. The outstanding feature of the job is the difficult foundation condition — a very soft bottom made the ordinary type of retaining wall impracticable. This condition was complicated by the fact that the railroad tracks to the piers, flanking one side of the seawall, will be liable to occasional change. It is highly desirable, therefore, to have a fill on the land side of the seawall to make track changes more convenient than if trestle supports were used. Solution of these requirements was found in a novel design employing a relieving platform fulfilling the dual function of supporting the fill above and transmitting to inshore batter piles the horizontal thrust against the concrete seawall proper. This combination presented a nice problem in making a tie between the concrete seawall and the timber caps of the relieving platform and also a difficult construction joint between the concrete wall and steel sheetpiling beneath it.

Precast Wall Units—In a total length of 6,100 ft. of seawall, precast slabs for the face are cast in three types; A, B and C. By far the largest part of the wall consists of the type-A slab which has a cross-section resembling the letter T lying on its side. That is, in this position the top of the T is in a vertical plane and this surface is the one exposed to tidal action. To get the maximum concrete density on this surface, where it is most needed, the plan of constructing the slabs is to cast them with this surface downward and to combine vibration and gravity in obtaining

MOTOR-DRIVEN CUTTERHEAD notches heavy timbers, for specified locations in relieving platform.



SLABS IN PLACE from land side. Inclined timbers and tierods are removed after concrete around timber caps has set. Note scabs over misaligned piles.



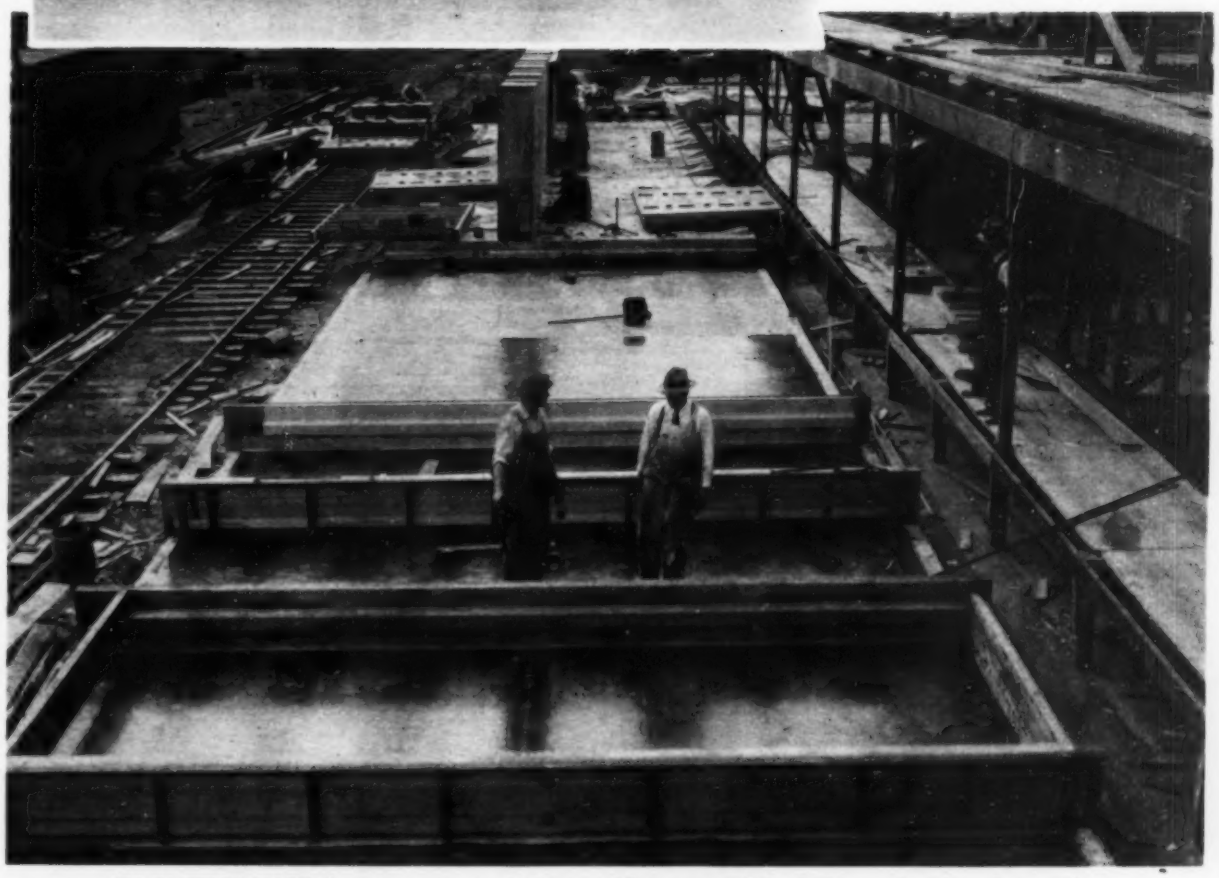
CUTTERHEAD IN ACTION. Head is driven by shaft from 5-hp. electric motor.

a smooth, compact placement on the bottom of the slab. The bottoms of the forms are lined with steel plates.

Forms for the slabs are set up in a long row in the casting yard and alternate slabs are poured successively. That is, after the forms have been removed from the first set of slabs, alternate slabs are cast in place between and against those first cast. Surfaces of the concrete against which fresh concrete is to be placed are thoroughly coated with a film of tallow. Thus formwork is reduced and a perfect fit is insured because each slab is numbered and eventually is placed in the seawall in the same relation to other slabs which it occupied on the casting bed.

Specifications require the concrete to show a compression strength of 3,000 lb. per square inch after 28 days. This requirement has been greatly exceeded —a recent test of nine samples in compression showed the lowest to register 5,346 lb. and the highest 7,835 lb., while the average was 6,600 lb. per sq. in. With concrete of this quality, the city has little fear of its ability to resist sea water. The contractors take particular pride in the very smooth, glossy finish on the surafce which will be exposed to sea water when the slabs are in place. This surface has an almost glassy appearance as the result of the care taken to obtain maximum density on this face.

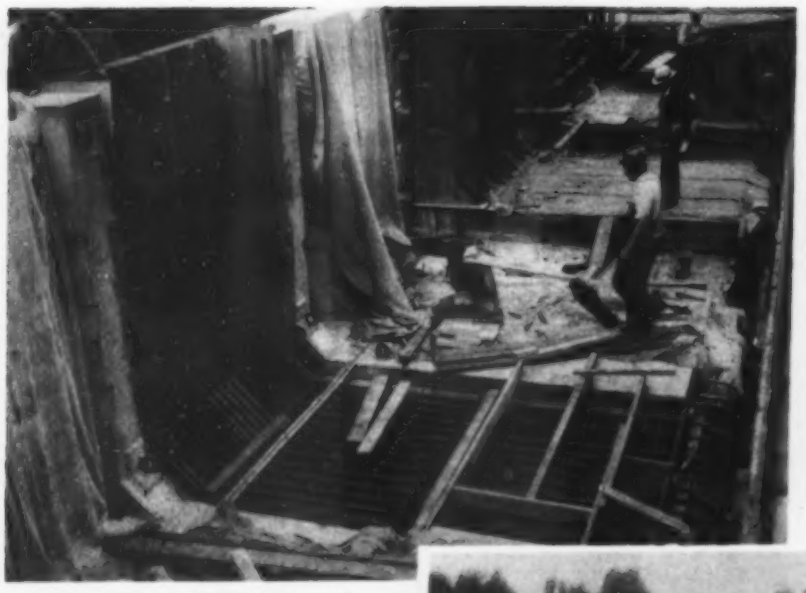
Relieving Platform—Construction of an ordinary relieving platform to carry a fill on piles would have been a simple matter, but this particular relieving platform has to resist horizontal thrust which will be transmitted to the 12x14-in. timber caps running across the pile tops at right angles to the seawall prop-



IN CASTING YARD forms are set up and alternate slabs are poured. Steel plates on bottom make smooth face for water exposure.

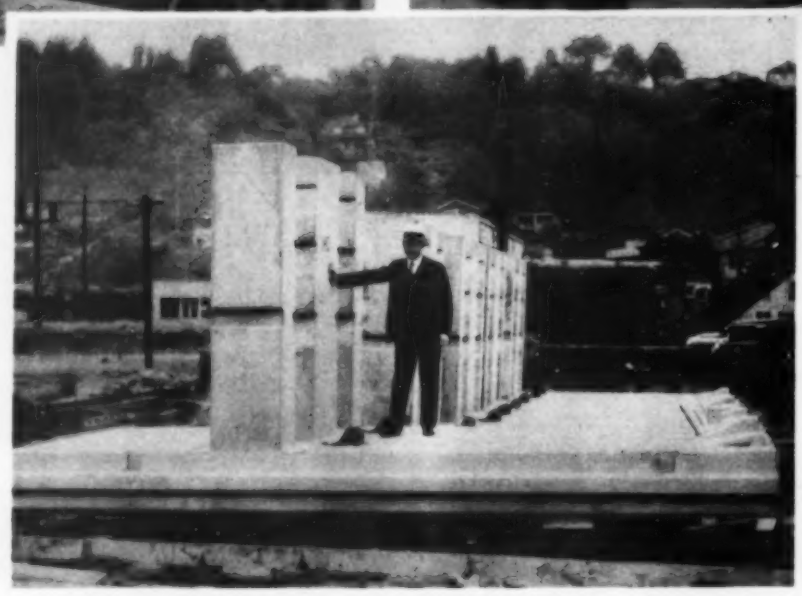
er. On part of the job where this thrust is heaviest it is carried by batter piles leaning both toward and away from the seawall. Where the thrust is less, batter piles in one direction are sufficient.

Each concrete slab has two open spaces in its horizontal portion into which fit the ends of the 12x14-in. caps, with ample space on either side for placing concrete to effect a bond between the precast slab and the timber cap. Both the timber and the concrete are notched. Concrete tamped into place to make the joint tight after the as-

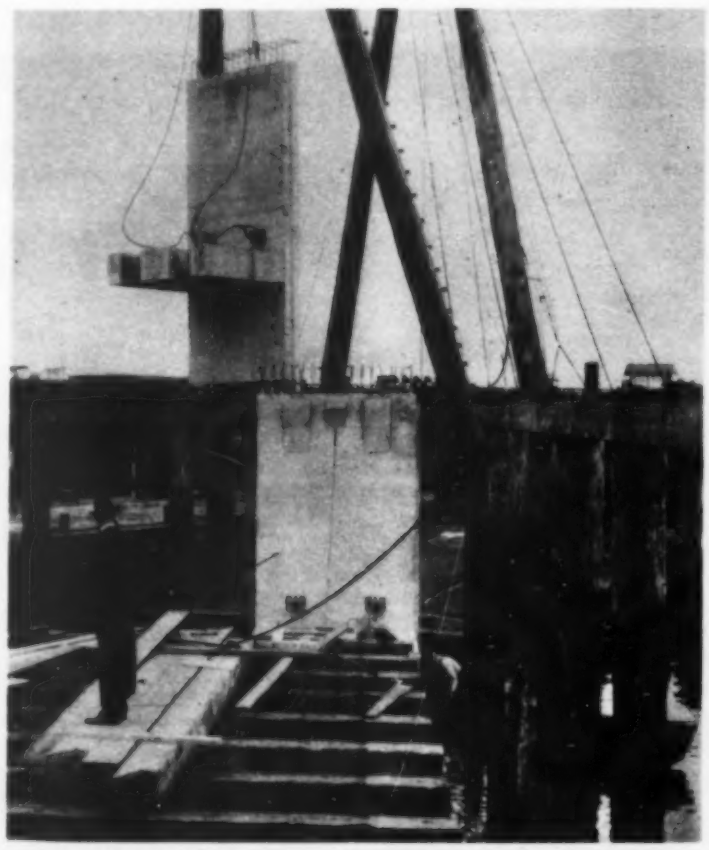


REINFORCING STEEL is placed in alternate form assemblies preparatory to pouring concrete for seawall structure.

PRECAST SLABS in yard. Note notches in vertical portion (to be horizontal when placed) to correspond with timber notching.



FINISHED SLABS lying on face in storage. Note notches in recesses for timbers. Rectangular slot on edge forms half of square hole between slabs used for sluicing fill.



PLACING SLABS by lowering with lines to bolts in upper edge. Note slack lines to bolts over horizontal center of gravity used in picking up precast slab.

sembly of the two parts develops a bond capable of transmitting the calculated thrust for the heaviest part of the construction, 38,000 lb. per lin. ft. of wall.

Notches in the precast slabs are formed by inserts of the required shape placed in the forms before the concrete is cast. Notches in the timbers, on the other hand, have to be cut. For this purpose special machinery was built in Seattle consisting of a cutterhead mounted on the end of a shaft from a 5-hp. motor. The motor is supported in a frame with facilities for swinging it and fastening it in any position so that it can be adjusted to cut slots in the desired location. By using different cutterheads it is a simple matter to make notches of different shapes to fit requirements for keyways or the larger notches at the cap end.

As a practical matter the driving of long batter piles does not permit finishing with the pile heads at an exact predetermined location. On this job, therefore, the piles first are driven as nearly to the required location as is possible without undue care in driving. A survey then is made with a transit, and the exact location of the pile heads, after cutoff, is plotted. From data plotted in this way offsets are made on the timber caps, where necessary, by bolting 4x12-in. timbers to the sides of the caps, thus giving an increased width to provide full bearing on the pile tops. Similar attachment of 4x12-in. timbers is made frequently on the underside of the caps to provide thrust blocks behind the heads of batter piles. On both bottom and sides, wherever 4x12's are bolted to the cap timbers, keyways are cut in both timbers with the motor-driven cutterhead, and after the two members have been bolted together the keyways are filled with a relatively dry cement mortar tamped firmly in place by hand. The keyways are thoroughly wet before being filled. Keys of this type have the advantage that it is not necessary for the keyways to jibe exactly and the key material is placed with less trouble and expense than would be required for the usual type keys.

Steel Sheetpiling—Although the precast concrete slabs are supported on horizontal timbers running along the outer edge of the relieving platform, the bottoms of the concrete slabs must make a tight joint with steel sheetpiling. This steel piling extends vertically down into the bottom to depths which vary according to the conditions along different parts of the work. Where the horizontal thrust is heaviest master piles also are used, in some cases up to 110 ft. in length. This steel piling provides a tight cutoff to prevent any tendency to slip in the soft material along this part of the waterfront.

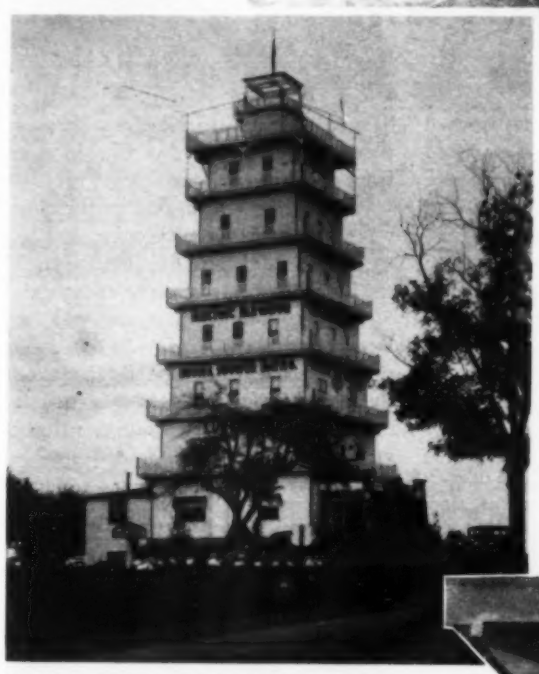
The sheetpiling is driven after a convenient support for the piledriver has been provided by completion of the relieving platform. Where the steel piling projects only a short distance above the ground line, concrete forms are provided by rows of tongue-and-groove lumber driven both sides of the sheetpiling. In the trough thus formed, tremie concrete is poured around the top of the sheetpiling and the bottom of the precast concrete slab. Where the ground line is considerably below the top of the piling, a protective facing of concrete is poured in place and is bonded to the sheetpiling by steel projections welded to the piling for this purpose before driving.

The work is being done under the direction of Major O. A. Piper, acting city engineer, according to designs developed by Clark H. Eldridge, city bridge engineer, who is in direct charge of construction. W. F. Way as consulting engineer reviewed the design. H. F. Faulkner is in charge of tests for the city. Principal contractors, all Seattle firms, are as follows: driving timber piles, Manson Construction & Engineering Co.; furnishing precast concrete sections, General Construction Co., placing concrete sections, Hagman & Larsen, Inc.; placing filling material, Western Construction Co.

International News Photo

KEY TO BETTER ROADS *(left)*. Unusually appealing corps of assistants helps Director Earl Lee Kelly, of California Department of Public Works, unlock improved section of Santa Monica Coast Highway to traffic.

AFTER THE HIGHWAY *(below)* comes the roadside hotel. This one in Michigan, far from any town, resembles Chinese pagoda in outward appearance but offers inner conveniences such as shower baths and electric elevator.



JOB ODDITIES

A Monthly Page of
Unusual Features of Construction

FIRST PENSTOCK SECTION at Norris Dam is transported to place by two cableways as Tennessee Valley Authority's great hydro-electric project on Clinch River, Tenn. reaches another stage in its construction.

GRADE SEPARATION BRIDGE *(right)* in Holland anticipates completion of approach fills for upper-level highway. Concrete in structure was vibrated externally by vibrators attached to forms.

ARMORED TRACTOR *(left)* mounting five drifter drills, manned by crew wearing helmets and masks as protection against falling rocks and fine dust, sinks drilled holes for excavation of cutoff trench 100 ft. above streambed in east abutment of San Gabriel No. 1 Dam, being built by West Slope Construction Co. for Los Angeles County Flood Control District.

NIGHT WORK at Norris dam is aided by string of electric lights suspended from cableways.

Demountable Cableways

Place Concrete at Norris Dam

HANDLING of the 1,000,000 yd. of concrete required in the construction of Norris dam of the Tennessee Valley Authority project on the Clinch River in northeastern Tennessee is being done with duplicate 1925-ft. span cableways each having a rated capacity of hoisting 18 tons on the hook at 300-ft., lowering this load at 400 ft. and conveying it at 1,200 ft. per minute. The structural steel towers on which the cableways are mounted have a 475-ft. travel range at a maximum speed of 50 ft. per minute. Electric motors drive the main hoists and the tower-moving winches.

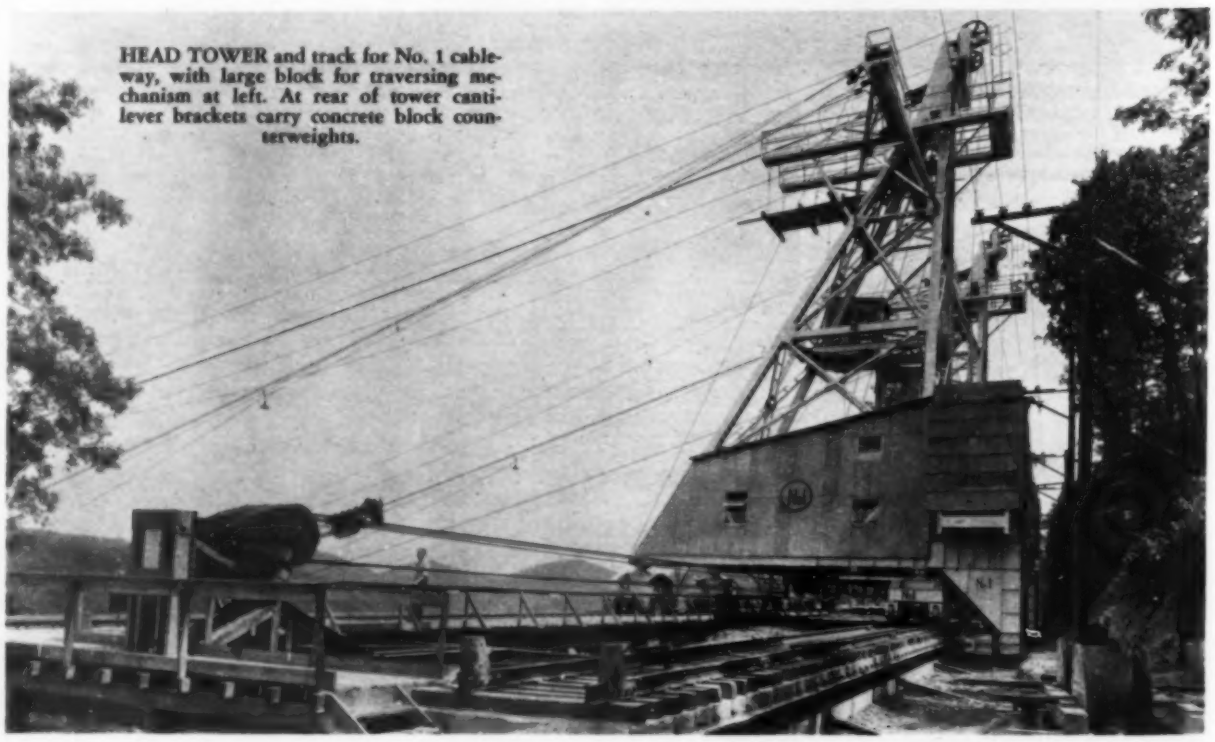
Decision to install semi-permanent, high-priced equipment of this type on a construction job lasting about 2½ years was based on a number of factors. In the first place, the site is ideally adapted for cableways and construction economics justified their adoption over other types of equipment. Secondly, TVA plans to build additional large dams on which these cableways may be used again to good advantage. Finally, maximum reliability of equipment is assured, and with the volume of concrete to be handled and the need for early completion of the project, it is entirely practical to charge the entire cost of the cableways to this dam, which is being done. Whatever salvage value may be obtained from them will be credited on the later dams on which they may be used.

Plant for production of the sand and broken stone required for Norris dam was described in *Construction Methods* for September, p. 42, while equipment and methods used in mixing and delivering to the cableways the concrete for the project were discussed in last month's issue, p. 42. The west abutment of the dam rises 360 ft. in about the same distance horizontally, while the east bank is on a considerably flatter slope. The concrete mixing plant is directly upstream from the west abutment. Standard-gage tracks leading from the mixing plant to within range of the cableways are at El. 1060, which is the elevation of the roadway on the dam. Rail-head height at the head towers is El. 1165 and at the tail towers, El. 1062.

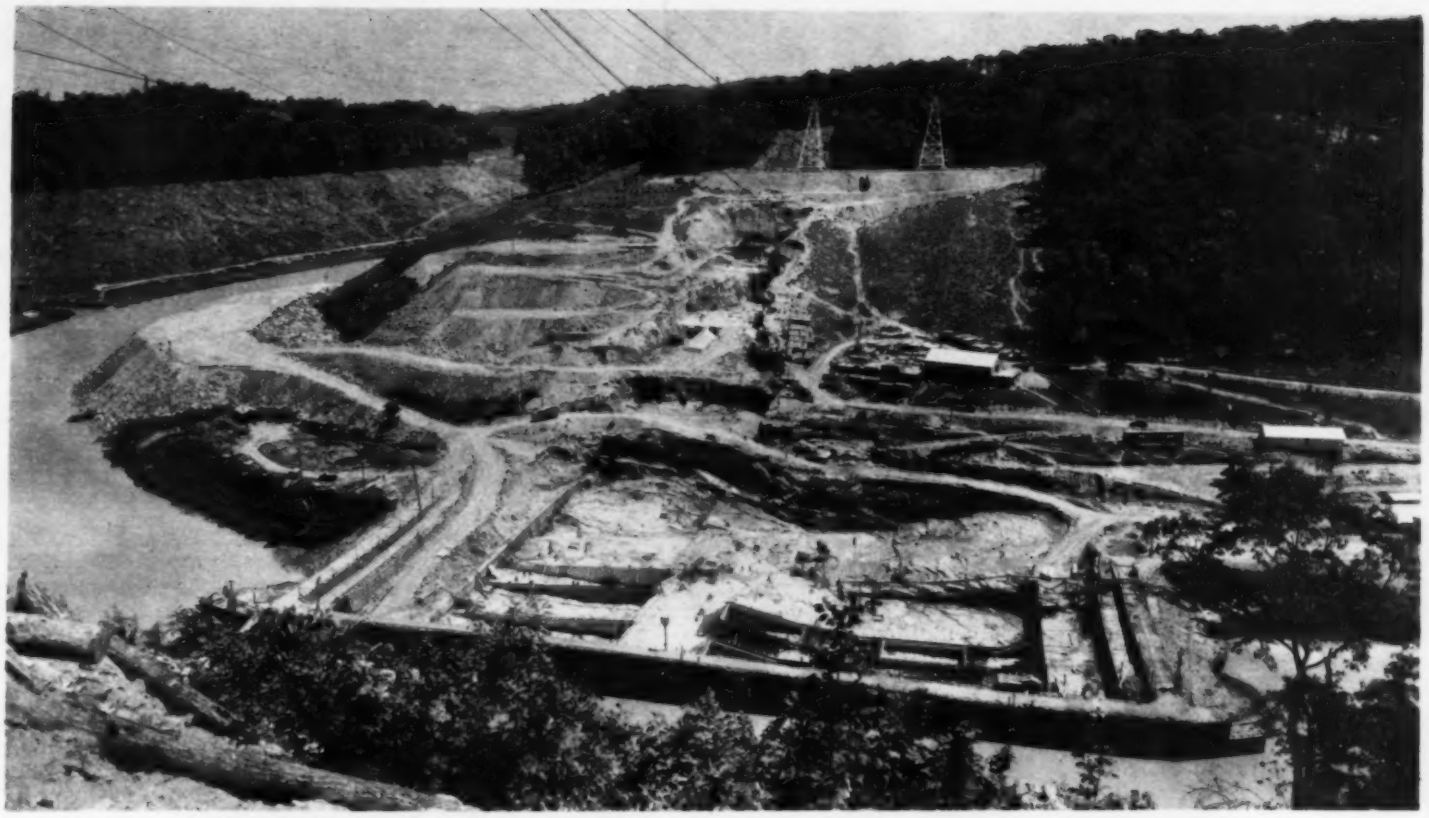
These conditions allow for a minimum clearance of 40 ft. at the middle of the dam with a 15-ton hook load. Handling of 36-ton penstock sections is done with the two cableways worked jointly. These heavy loads also are lifted toward the bottom of the dam where clearance is not a factor. Experience in operating the cableways, as designed and installed, has shown that at no stage of the job is the matter of clearance in any way a controlling operating condition.

Each head tower with its operating machinery, counterweight, equipment and a full-rated load on the hook brings a total weight of about 650 tons on the two standard-gage tracks on which it travels. Each tailtower similarly loaded weighs about 635 tons. Provision also had to be made to take a maximum outward horizontal thrust of 250 tons from each tower.

At the downstream end of the runway both tracks are on steel trestles erected on solid rock, the forward track trestle being 75 ft. and the rear trestle 50 ft. long. At the upstream end the front track is carried for 165 ft. by a trestle erected on earth. The trestle on the downstream end was designed to take horizontal thrust, while this thrust on the upstream trestle is delivered to the rear track, which is on a concrete footing anchored to deadmen set in concrete in earth pits. The tail towers are



HEAD TOWER and track for No. 1 cableway, with large block for traversing mechanism at left. At rear of tower cantilever brackets carry concrete block counterweights.



DAMSITE in Clinch River, looking toward tail towers of 1,925-ft. span cableways from high west abutment. First forms for concrete are set within cofferdam in foreground.

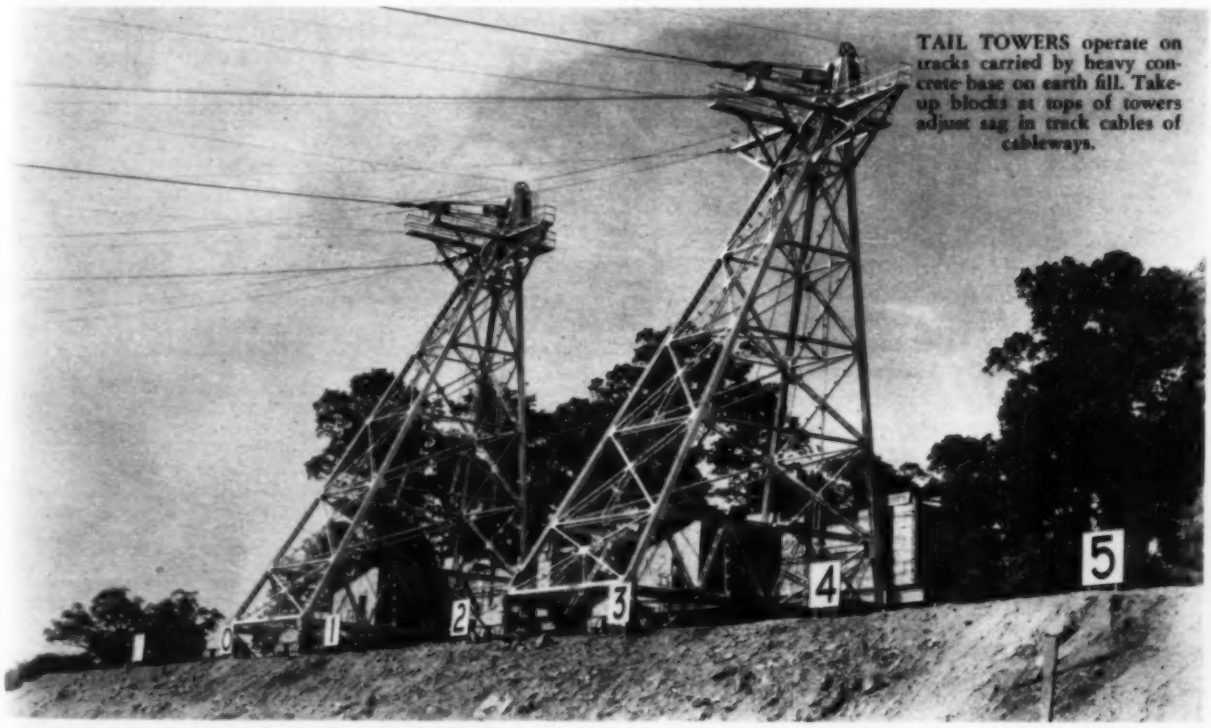
on two tracks of the same gage, carried by a heavy concrete base built on an earth fill.

Each tower is mounted on four trucks, with eight traveler wheels per truck. Each truck wheel operates on its own independent axle for easy removal and replacement. One truck comes under each of the four legs of the tower, with a ball-and-socket connection to the tower to provide equalized loading on all wheels in spite of irregularities in the tracks. Racking of the structure thus is reduced to a minimum.

An outstanding feature of the design is the manner in which the horizontal thrust from the cableway is delivered from the towers to the supporting structure. The floor girders are extended beyond the base of the rear of the towers to form two heavy cantilever brackets which perform two main functions. First, they carry a frame on which is placed the sectional concrete block counterweight required for each tower. Second, they each carry a horizontal truck mounting of four traveler wheels in tandem by means of which the entire horizontal thrust from the cable reaction is transmitted to the concrete base on which the supporting tracks are placed.

Neutralizing of the bending moment in the bracket, due to the counterweight, is almost completely obtained by an opposite moment from the horizontal thrust wheels. At the same time, the horizontal wheels also permit reliable definition of the forces acting on the track base, simplifying the design of the latter. They further allow a better arrangement of the wheels in the trucks carrying the towers. By limiting the loads on the 32 vertical truck wheels to 65,000 lb. maximum per wheel, and with the duty of meeting the overturning moment eliminated, it was practicable to raise the tower and provide self-equalizing construction within the four trucks carrying the structure.

Provisions were made to keep the horizontal thrust wheels in the proper plane and position. Each horizontal thrust truck takes bearing against the foot of the corresponding bracket through a ball-and-socket joint to allow for irregularities in the track. Two suspension rods, each carrying a heavy coil spring at the point of support on the bracket, hold the horizontal trucks level. Finally, the rail on which the horizontal thrust wheels travel is supported by clamp bolts set in vertical steel socket grooves in the concrete base of the tower tracks so they may be raised or lowered as may be necessary to hold the rail in the right position.



TAIL TOWERS operate on tracks carried by heavy concrete base on earth fill. Take-up blocks at tops of towers adjust sag in track cables of cableways.

Each head tower has a counterweight consisting of 84 precast concrete blocks totaling 380 tons, while similarly arranged blocks on each tail tower provide a 435-ton counterweight. This design contrasts with the usual procedure of casting the concrete solid around the base of the rear tower legs. With the separate precast blocks it is possible to remove them and dismantle the tower without loss of any of its members. It also is planned to use the concrete blocks later for riprap lining in the tailrace and spillway channel of the project.

Further to facilitate dismantling and reerection, all towers were erected with removable rivet-bolts. The latter have a self-locking thread and a fluted shank having an outside diameter larger than the hole in which they are used. When driven with a heavy hammer the shank deforms to a tight fit, improving the shearing resistance of the bolt. Tests indicated that connections made with these bolts were as strong and as satisfactory as when hot rivets were used. When removed the rivet-bolts also leave the structural members in better condi-

tion than is usual when hot driven rivets are cut off and backed out.

Each main track cable is of the locked-coil type, 3 in. in diameter. Under deflection of 5½ per cent and with a total maximum live load of 18 tons, this cable will be stressed to 362,000 lb. The cable weighs 22.2 lb. per foot and has a breaking strength of 1,100,000 lb.

Both ends of the cable are anchored with molten zinc in a heavy steel socket mounted on ball bearings in a yoke in such manner that a slight turn may be taken on the cable whenever desired to keep the strands properly set and to distribute wear. The end of this socket is notched to fit a locking bar on the yoke. Turning of the cable is thus prevented, except when planned.

At the tail tower end of the cable is a specially designed double-block ten-part-line take-up to which the yoke of the socket is attached. With this take-up it is possible to maintain the desired sag in the cable.

In order to distribute the load over a considerable length of the track cable the main carriage is in two parts. Each part is suspended on six 24-in. tread diameter track wheels spaced 33 in. on centers. The two parts of the carriage are in turn spaced 6½ ft. apart, making the total length of the carriage 34 ft. on the cable.

For the endless conveying cable 1-in. plow steel hemp-center construction wire rope is used. The hoisting line is of ⅞-in. diameter of the same construction. The ¾-in. button rope, with 8 buttons, is fastened to the tail tower

8-YD. BUCKET of concrete is descending from cableway to forms within cofferdam. Cableway head towers are in upper left-hand corner and concrete mixing plant to left of bucket.

and extends over a sheave on the top of the head tower to a 3-ton counterweight. The latter is free to travel vertically 12 ft. to follow changes in the sag of the track cable. All sheaves are of heavy-duty type of extra large diameter and are fitted with roller bearings.

The main hoist for each cableway is a three-drum tandem unit mounted on a single bed plate and driven by a 400-hp. 2,200-volt electric motor placed on an extension of the bed plate. Under normal operating conditions on this job only two drums are used, since the bucket handled by the cableway is manually dumped by air at the point where concreting is in progress. Decision to buy the three-drum hoist was made, however, in order to have one drum as a standby for the hoisting line and for emergency service. Consideration also was given to the higher salvage value of a three-drum unit.

Operation of the main hoist is by remote control from a cab about half way up on one front leg of the head tower. In this position the operator is located where he may see practically the entire range of the hook on the carriage. The remote electrical control manipulates not only all motor operations in the head and tail towers, but also all braking. Electrically operated air valves on the main hoist control the air cylinders on the friction clutches of the drums. The band brakes are weight set and released by air pistons. All lowering of loads is controlled by regenerative braking on the main hoist motor.

Travel of each tower is accomplished by means of a 75-hp. moving winch on an endless cable through blocks at both ends of the tower runways. This cable is ⅞-in. plow steel with steel center. Both the head tower and tail tower winches are controlled from the operator's cab. Each tower carries an arm projecting toward the other tower in such manner that these arms contact and throw out limit switches on both towers, in case the latter approach each other too closely. In order to prevent the towers overrunning at either end, limit switches also are provided to act automatically.

Power to operate the motors on the head towers and all auxiliary equipment is taken from a three-wire trolley line supported at the rear of the runway. Takeoff for each tower is by means of a sliding contact. A similar trolley system delivers power to the tail tower. Only the control wires for this tower span across the valley from tower to tower.

Since the placing of concrete will be carried on day and night, six days a week, it was necessary to have excep-

RIVET-BOLTS are being used in erection of structural steel for tail tower.

ERECTION of steel for tail tower is being handled by stiff-leg derrick and rivet-bolts.

tionally good illumination of the entire area which the cableways serve. Flood lights on the towers and flood lights and smaller lights in the cofferdam afford local distribution of illumination. A system of suspended 1,000-watt electric lamps on the cableways has proved exceptionally effective in obtaining shadowless illumination without glare entirely across the site.

To support these lamps each pair of cableway towers carry two ¾-in. messenger lines, spaced 50 ft. apart on centers. This places the rows of lamps 25 ft. from the track cable, with the messenger lines carrying them sagged during the early part of the job to locate the lamps a maximum of 50 ft. below the track cable at the middle of the span. In this position the messenger cables and the lamps are entirely out of the way of all operations. A large item of electrical maintenance expense and breakage thus is eliminated as compared with a more extensive illumination system on the ground.

CABLEWAY OPERATOR *(right)* in head tower keeps in touch with signal men by means of telephone headset. He handles entire cableway movement by finger-touch remote controls.

Suspension for the two lamp-messenger lines was obtained at little additional cost by extending the platforms at the tops of the head and tail towers to get the proper spacing for these lines. At the head tower end the messenger line is reeved through a 12-ton derrick strap block and extended to the base of the tower to provide means of raising or lowering the line. The other end of the messenger line is anchored to a tail tower.

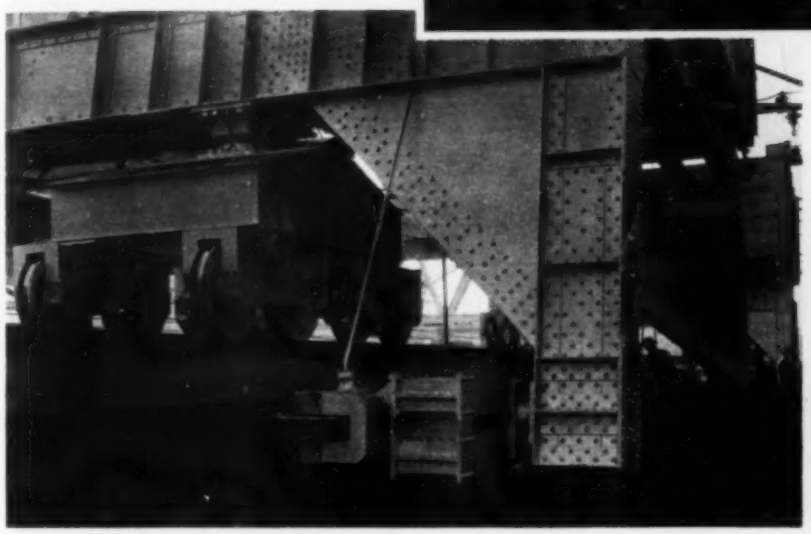
Each lamp is hung from the messenger line by a 3-in. grooved wheel carrying a simple strap connection to which the lamp and its weatherproof fixture are fastened. Spacing of the lamps and fixtures is maintained by a ¼-in. wire line to which they are clamped at 200-ft. intervals. Each fixture is tapped to a double No. 4 conductor wire swung from the lamp and fixture supports. The lights are serviced by being drawn into the tail towers by means of a hand-operated reel.

All signalling for cableway operations is done by telephone. The operator in the cab receives his signals over a telephone and amplifier horn system directly from a man equipped with a telephone set on the platform where the concrete handling buckets are landed to be charged by the transfer cars from the mixing plant. The cableway operator also receives signals directly from a signal man stationed in the hole close to the point where concrete is being placed. All telephones are on the same line and the operator has a transmitter to talk to the signal men. In addition to all three men being constantly in touch with each other in this manner, they can all see every position of the hook.

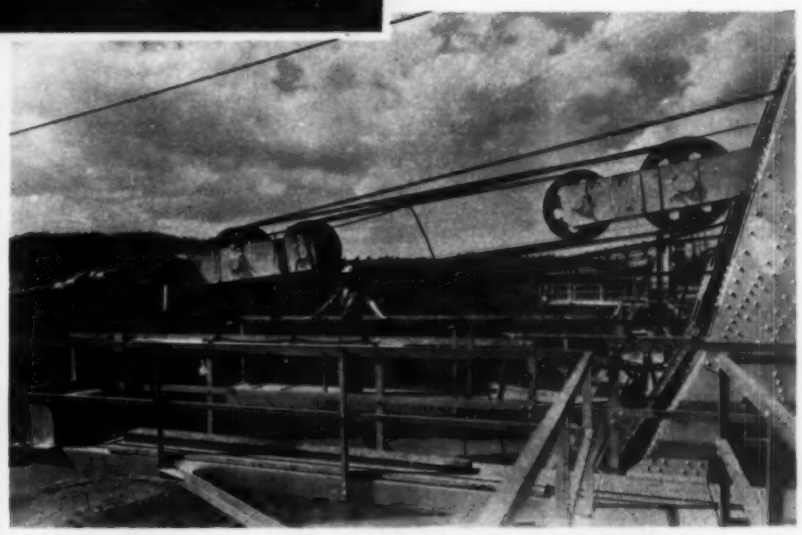
Experience in placing the first 100,000 cu.yd. of concrete in the dam has shown that the cableways can maintain a rate of pouring well in excess of expectations. It was anticipated that each cableway would place concrete at the maximum rate of one bucket every 4 min. Under favorable conditions it has been possible to maintain a rate of 20 buckets an hour and more than 2,000 cu.yd. of concrete in 22 hr. on one cableway.

While no stunts have been attempted with the cableways, they have readily met the designed capacity for lifting and handling assembled sections of the penstocks for the power house, weighing in some cases 40 tons to the section. With both cableways making these lifts jointly, operations have been smooth and free from undue sag or strain.

A. E. Morgan is chairman and chief engineer of the Tennessee Valley Authority. C. A. Bock is assistant chief engineer, C. H. Locher, construction consultant and A. J. Ackerman, construction plant engineer. Barton M. Jones is construction engineer on Norris dam, with Ross White, superintendent of construction, and F. C. Schlemmer and E. M. Whipple, assistant superintendents of construction.



HORIZONTAL THRUST of cableway is taken by horizontal wheels mounted at base of cantilever bracket of head tower. Above is one of the 8-wheel trucks carrying the tower.



DETAIL of tail tower cable anchorage, showing yoke take-up device to regulate sag of cable.

STEEL SOCKET, into which molten zinc is poured, serves to anchor cable securely at tower.

BUCKET on landing platform has been filled with 8 cu.-yd. of concrete and is ready to be picked up by cableway.

Waterworks at Wilmington, Delaware,

REMODELED AS PWA PROJECT

AS THE first step in an interesting remodeling operation which will transform a portion of the Wilmington, Del., waterworks, Henry E. Baton, Inc., of Philadelphia, general contractor for the work, constructed a temporary wooden flume 125 ft. long inside an old covered raceway, the walls of which were to be partly demolished and replaced as one portion of the foundation construction under a new two-and-one-half story office building. Once the raceway flow had been diverted to the flume (designed to carry 19 million gallons a day), the contractor proceeded with demolition of 340 cu. yd. of old masonry and with the placing of 72 cu.yd. of reinforced concrete in the footings and foundation walls of the new structure. This work was executed without the intrusion of any water except surface drainage. A light crane handled the removal of broken masonry and of earth excavation, which amounted to 1,850 cu.yd.

A former grass plot in front of the existing office building of the city water department forms the site of the new building. This grass plot rested in large part on top of the old covered raceway, which was roofed over with concrete jack arches supported by steel beams. To break up the concrete of the roof and walls, the contractor used drills and hammers supplied with air by portable compressors.

LIGHT POWER CRANE mounted on tractor removes broken concrete and earth from old raceway after flow has been diverted to temporary wooden flume. Pumping station is in background.

A Michigan full-revolving crane, equipped with pneumatic operating controls, loaded the spoil into trucks with a ½-yd. clamshell bucket. Because of its light weight this unit could move close to sheeted trenches ranging up to 20 ft. deep. Ready-mixed concrete was placed in the footing and substructure wall forms, which required 720 cu.yd., reinforced with 21½ tons of steel rods.

Following completion of the two-and-one-half story building, the water department plans to move its offices out of the present quarters into the new building, permitting the old building to be remodeled into a pump house and boiler room. This remodeling calls for construction of a brick stack 180 ft. high above the concrete foundation. When the new boiler room has been put into service, the 208-ft. brick stack of the present boiler house will be razed. All this work is included in the contract with Henry E. Baton, Inc., valued at about $200,000. Financing is by department funds and a PWA grant.

Standard PWA regulations govern working conditions on the job. Employees are limited to 30 hr. each week. Two 6-hr. shifts per day are employed, the first from 6 a.m. to 12 m. and the second from 12 m. to 6 p.m. The two shifts work 5 days each week, Monday to Friday, inclusive, unless bad weather or other conditions cut into the normal working time. In this case, Saturday is available to make up the lost time. Time lost because of bad weather or other unfavorable conditions may be made up, according to a PWA ruling, within 20 days.

Preliminary studies of the remodeling program were made by the water department, which also performs the engineering inspection of the work. W. Compton Wills is chief engineer of the department, and I. Franklin Story is engineer in charge for the department in the field. Fuller & McClintock, of New York City, were consultants on the design of the raceway, foundations and temporary flume, and on the remodeling of the existing office building. The superstructure of the new building was designed by Brown & Whiteside, architects, of Wilmington. For the contractor, Morten Schilbred is superintendent in charge of the work. G. W. Francis is resident engineer-inspector for the Public Works Administration, acting under Charles H. Fleming, engineer for Delaware.

LINE DRILLING is employed to demolish part of old forebay wall, leading from raceway into turbine room of pumping station.

STEEL BEAMS AND JACK ARCHES of old raceway roof are exposed by demolition. Clamshell bucket removes spoil from foundation excavation.

Present and Accounted For —

A Page of Personalities

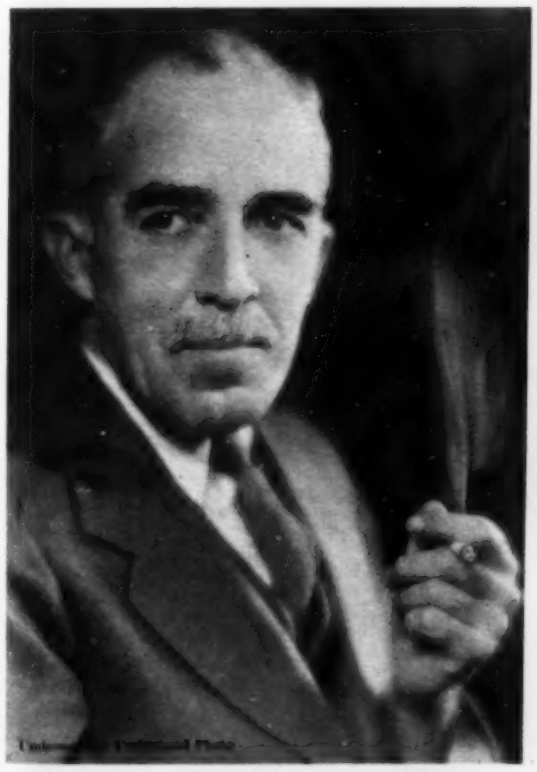
Blackstone Studios

LEADS NEW ORGANIZATION—D. B. Steinman, of Robinson & Steinman, New York, is first president of National Society of Professional Engineers, which proposes to improve professional status of engineers by promoting state license laws and fostering state societies for local advancement of profession.

BUILDING GRAND COULEE RAILROAD—David H. Ryan, contractor, of San Diego, Calif., and E. Paul Ford, foreman, construct spur line from Odair, Wash. to dam site on Columbia River.

Underwood & Underwood Photo

CODE AUTHORITY COMMITTEE CHAIRMAN —DeWitt D. Barlow, of Atlantic, Gulf & Pacific Co., heads executive committee of River and Harbor Improvement Industry's Code Authority. Mr. Barlow also sits with other members of this committee on a joint committee with representatives of the Construction Code Authority to pass on border-line cases between two jurisdictions.



BECOMES ACTING DEPUTY ADMINISTRATOR—Major Philip B. Fleming recently was appointed to new executive position by Public Works Administrator Harold L. Ickes, assuming immediately duties of Colonel Henry M. Waite, deputy administrator, whose resignation took effect Sept. 1. During last year Major Fleming, as executive officer, served as principal assistant to Colonel Waite.

International News Photo

GOLDEN GATE BRIDGE ENGINEER —Joseph B. Strauss, of Chicago, is serving as chief engineer of Golden Gate Bridge and Highway District, of San Francisco, which is building across entrance to San Francisco harbor world's longest suspension span, 4,200 ft., to be supported by towers 746 ft. above mean high water. Bridge will cost $35,000,000 and will have total length, including main span and two 1,125-ft. side spans, of 6,450 ft. Two main cables are 36½ in. in diameter. Among well-known bridges that Mr. Strauss has had leading role in designing and constructing are those across the Mississippi, at Quincy, Ill., the Columbia, at Ranier, Ore., the St. Lawrence, at Montreal, and the Potomac, at Washington.

Blank & Stoller Photo

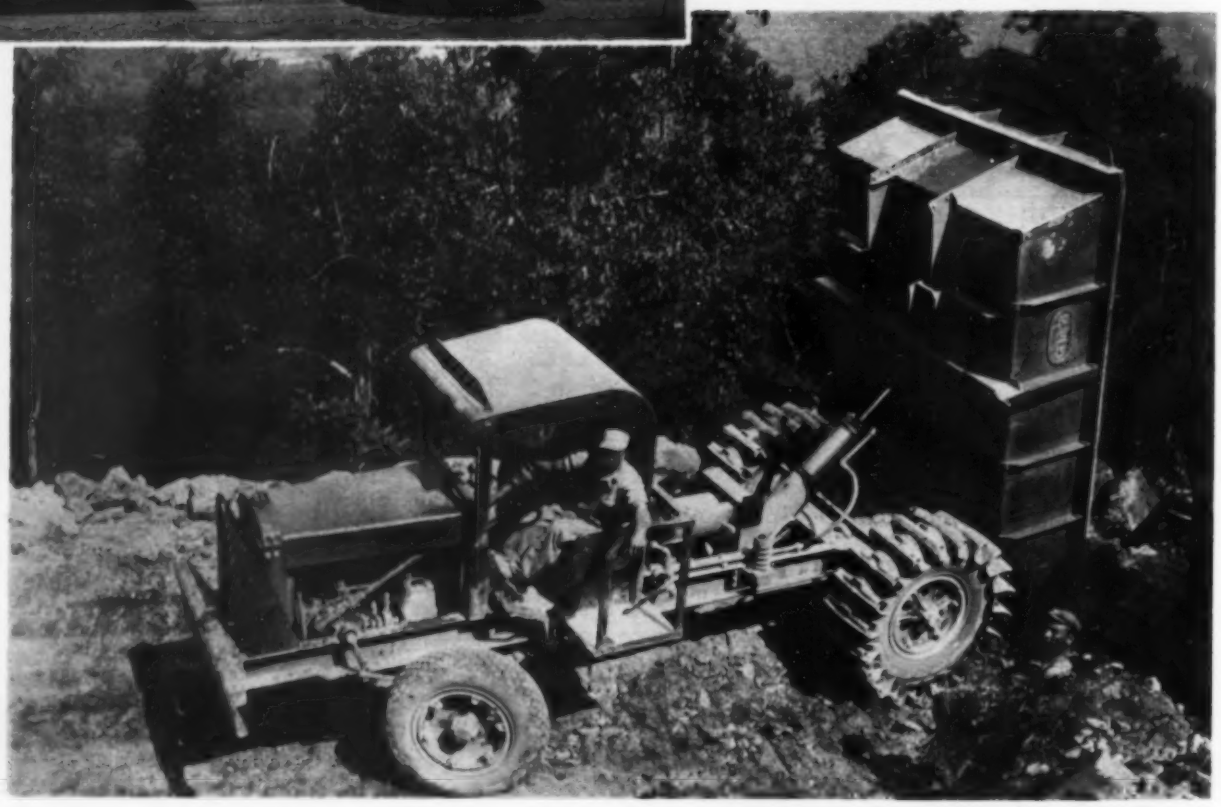
ARCHITECT AIDS BUSINESS ASSOCIATION—Harvey Wiley Corbett, of Corbett, Harrison & MacMurray, has accepted chairmanship of construction division in campaign of New York business men to increase membership in Merchants' Association, which is attempting to obtain passage of new city building code, prepared by Association and now before Board of Aldermen.

NEW EQUIPMENT ON THE JOB

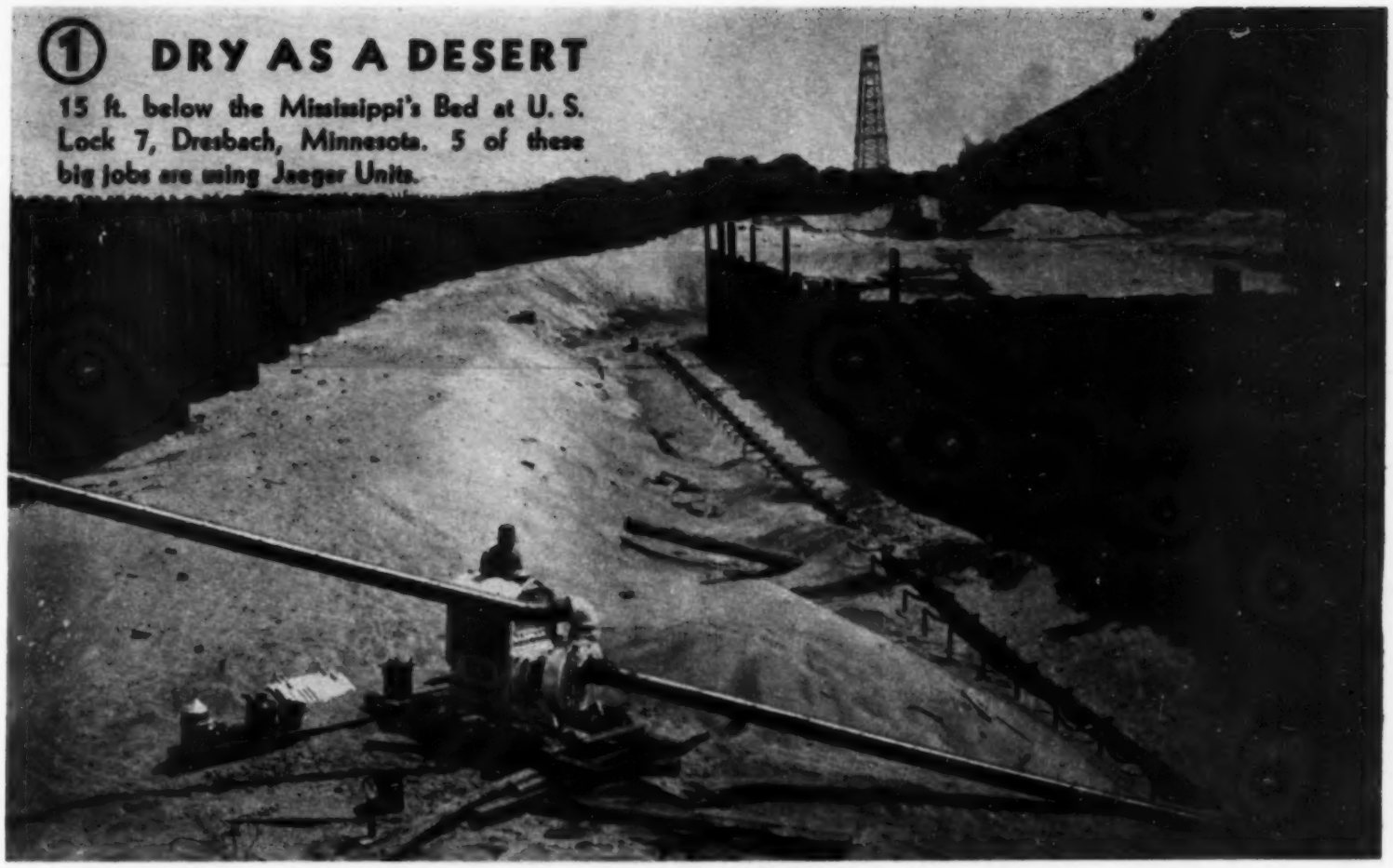
CRANE equipped with ½-yd. shovel dipper is one of new series of motor-truck-mounted, full-revolving, one-man operated units having lifting capacities of 8½, 7¾, 7½, 7, and 6½ tons at 10-ft. radius. Crane booms are 25, 30 and 35 ft. in length and may be equipped with 5-, 10-, 15- and 20-ft. extensions to provide maximum 55-ft. boom. Gooseneck extensions of 5 and 10 ft. also are available. Shovel boom is full shipper-shaft type, rope crowd, of same design as used on crawler machines. Dippers are furnished in ¾-, ½- and ⅜-yd. sizes. Use of Thew center drive principle of construction provides necessary balance to enable unit to lift 6½ to 8½ tons with total turntable weight within capacity of 5- to 7½-ton standard-make motor trucks.—Universal Crane Co., Lorain, Ohio.

VIBRATION-ABSORBING machine mountings and gasket applications where a combination of axial resiliency, strength and rigidity are required are uses of interest to the construction industry for this new sandwich-type product *(above)*, a material consisting of layers of soft rubber placed between sheets of Bakelite laminated. Number and thickness of layers may be varied to suit needs.—Synthane Corp., Oaks, Pa.

ROAD-BUILDER TRUCKS in two new models complete line of machines ranging from 1½- to 12-yd., designed to meet any dump-truck hauling requirement. One model, rated as 1¾ to 2½ ton with 11,500-lb. gross weight, is supplied with 1½- to 2-yd. power hoist bodies and single or dual tire equipment. Second model, rated as 2½- to 3-ton truck with gross rating of 14,500-lb., is available in 2- and 3-yd. body capacities and comes equipped with 5-speed forward and 2-speed reverse transmission. Designed with Hug front axle rocker action which takes care of uneven road conditions.—The Hug Company, Highland, Ill.



HOISTING to near vertical angle, thus speeding up operations by cutting down unloading time, is one advantage claimed for this Trac-Truk *(right)* which also incorporates in its design sloping rear end to take place of usual hinged end gate. Other features:—Exceptionally short wheel base and two supplementary foot-operated steering brakes for quick, short turning; positive braking from motor compression and gear reduction which assures extra safety as well as saving of brakes. Live load capacity, 20,000 lb. Body level content capacity, 6 cu.yd. Tire tracks, quickly installed, assure positive traction.—Euclid Road Machinery Co., Cleveland, Ohio.


① DRY AS A DESERT
15 ft. below the Mississippi's Bed at U. S. Lock 7, Dresbach, Minnesota. 5 of these big jobs are using Jaeger Units.

JAEGER *Improved* WELL-POINT SYSTEMS are Giving "Dry Job" Production and Lower Costs on Every Size of Job . . .

From the smallest sewer or conduit work to this 500 x 1000 ft. excavation below Mississippi River sand, Jaeger Improved Well Point Systems have eliminated the water problem and done it at low costs never before thought possible.

Jaeger Special Well Point Pumps, built in 6" and 8" sizes, combine enormous water capacities with double air capacity. Handle more points, pump more water, maintain the constant high vacuum which is essential in well point work for quickly exhausting headers and handling entrained air that would stop an ordinary pump.

No matter how small your job, write today for interesting facts and figures on modern dewatering. THE JAEGER MACHINE CO., Columbus, Ohio.

JAEGER "Sure Prime" CONTRACTORS PUMPS
2", 3", 4", 6", to 8" Sizes;
10,000 to 125,000 G. P. H.

② DISCHARGING 2000 G.P.M.
Keep that Job Dry!

MAIL THIS SLIP to The Jaeger Machine Company
800 Dublin Avenue, Columbus, Ohio
Gentlemen: I am interested in details and costs of Jaeger IMPROVED Well Point Systems and name of your nearest distributor.
( ) Send details on "Sure Prime" Contractors Pumps.
Name.....
Address.....

30 years of quality building laid the foundation for these great

NEW REO TRUCKS

ANYONE who knows trucks can see instantly that these great new Reos bring to the market something entirely without precedent in VALUES!

The ½-ton Speedwagon—new in the Reo line—has appearance and quality advantages that set it far apart from the field. Yet it is priced within a few dollars of the lowest!

The 1½-ton unit combines a gracefully streamlined exterior with quality features so extraordinary that any buyer who compares and analyzes should easily see the wisdom of investing the few extra dollars it takes to buy the Reo.

Both these new units, in fact, represent so much more truck for so little more money that good business judgment literally demands consideration of Reo before any decision is made on new equipment.

Thirty years of better-value-building laid the foundation for these new trucks—and they excel even the greatest Reo values of the past!

With the selection of a Reo comes the priceless advantage of Reo Ability Rating—the Exclusive Reo System that tells you in advance exactly what your truck will do. No truck today should be bought on any other basis by operators who are really interested in long life and low cost service.

A LOT MORE TRUCK FOR A LITTLE MORE MONEY

Next to seeing and driving the new Reo trucks, the simplest way of judging their exceptional quality is to compare them point by point with other trucks. With the Reo Extra Value Disc you can do this at a glance. Write us or ask your Reo dealer for this interesting disc and prove to yourself how much more truck you get when you buy a Reo!

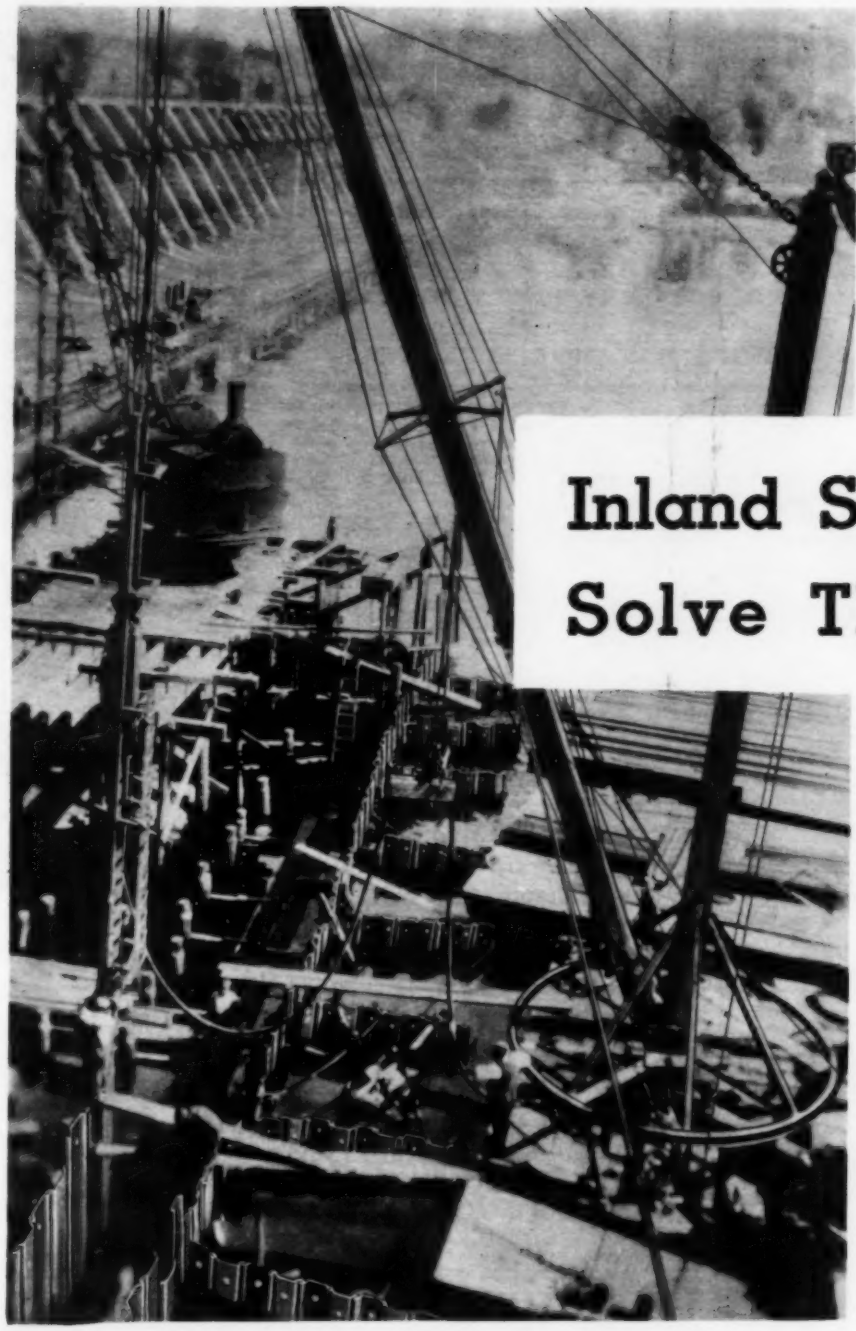
** Special equipment extra, prices f. o. b. Lansing, plus tax. Myers Magazine Chassis Lubrication, standard on 2-5 and 4-6 ton models; slight extra cost on other models.*

REO

MOTOR CAR COMPANY

LANSING, MICHIGAN

STANDARD BODY TYPES FOR NEARLY EVERY BUSINESS



Cofferdam for extending the apron of the Wisconsin Power & Light Co. dam at Prairie du Sac, Wis. Inland Section I-31 used. Jutton-Kelly Co., contractors.

Inland Suggestions Helped Solve This Sheet Piling Problem

IN this project it was essential that the inside of the cofferdam be kept clear of the conventional type of bracing. Inland sheet piling engineers solved the problem.

This was done by having the pressure of the water carried by the outside buttresses shown in the picture; the wales were lowered into place in saddles riveted to the inside of the buttress tees.

Several cofferdams were used and a considerable saving in time and cost was effected by the ease of this novel method of installation.

Inland engineers would welcome the opportunity of assisting in your sheet piling problems, too. INLAND STEEL COMPANY, 38 So. Dearborn St., Chicago.

Write for Catalog

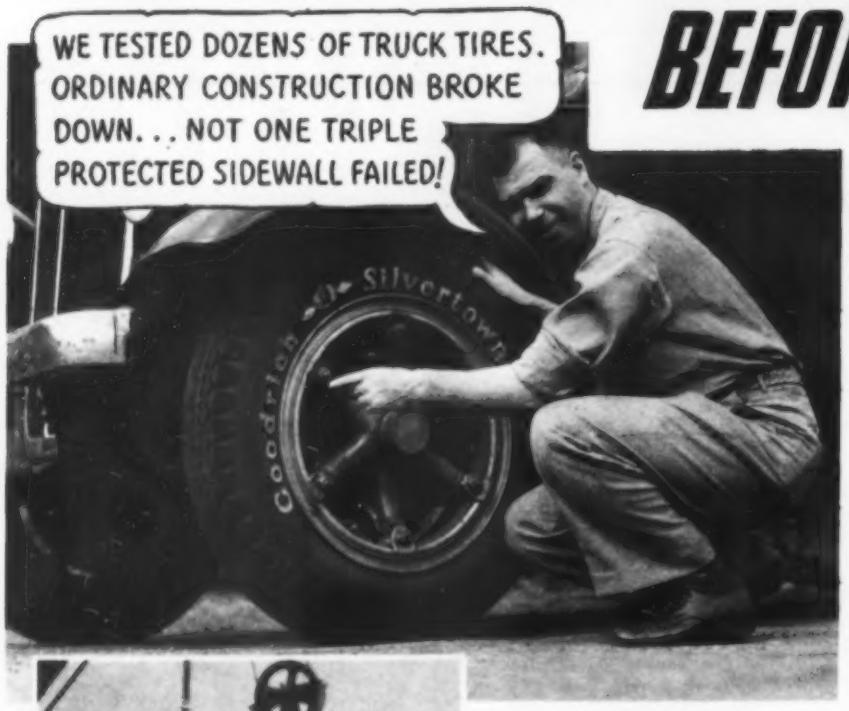
NRA CODE

INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Strip Tin Plate
Plates Structurals Piling
Rails Track Accessories
Bars Rivets Billets

PREVENT SIDEWALL BREAKS *BEFORE THEY START!*


WE TESTED DOZENS OF TRUCK TIRES. ORDINARY CONSTRUCTION BROKE DOWN... NOT ONE TRIPLE PROTECTED SIDEWALL FAILED!
Goodrich Silvertown

TRIPLE PROTECTED TIRES POSITIVELY CHECK 80% OF PREMATURE FAILURES

It's the sidewall that causes the grief with ordinary truck tires. It grabs money from the pockets of truck owners every day. You may be next.

But you *can* avoid unnecessary truck tire failures. Goodrich Silvertowns are triple protected at the sidewall! They handle jobs where other tires fall down. They're built to stand up under the flexing and friction that *causes* blow-outs. Actual road tests have proved that Triple Protection makes tires many times safer from sidewall breaks. You can make a test yourself. And save real money while doing it.

DROP A TON ON A TIRE! That's what happens when you dump a big shovel of stone or dirt in a truck. It's the *tires* that take the shock and carry the load. Is it any wonder that ordinary tires break through the sidewall? Is it any wonder you pay big repair bills, pay for lost time and idle equipment?

You can avoid these delays and extra expense with Goodrich Silvertowns that positively check 80% of premature failures. Put Triple Protected Silvertowns on your trucks. The tougher the job, the more you'll save yourself in time and money by changing over right now.

Give your Goodrich truck tire dealer a chance to prove that he can save you real money. Phone him now.

WHY SIDEWALLS FAIL—The sidewall is the weak spot in most truck tires. Many tires blow out because they do not have these three features. Every Goodrich Silvertown has this protection:

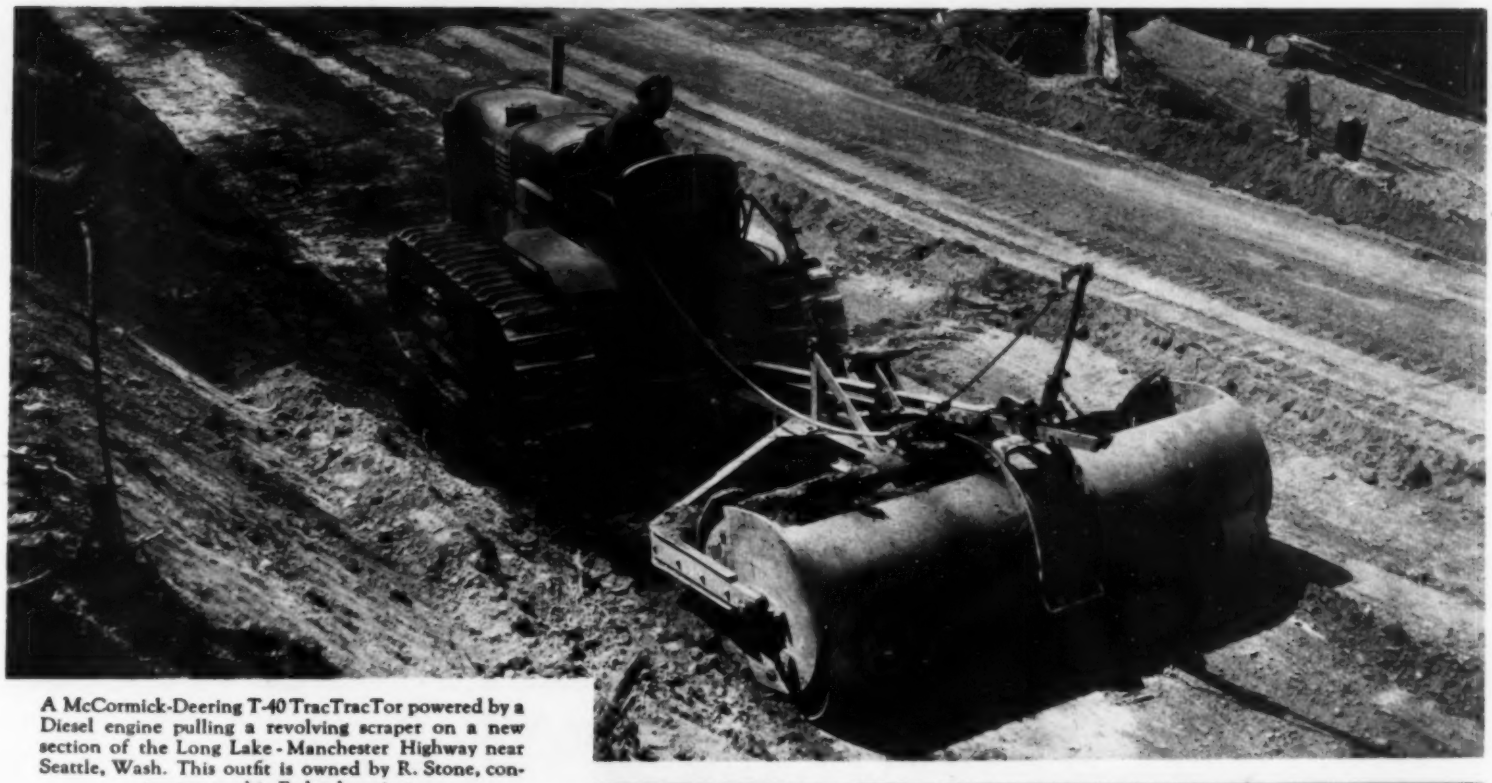
1 PLYFLEX—a *new*, tough, sturdy rubber material with greater resistance to stretch. A layer of Plyflex in the sidewall distributes stresses and strains—prevents ply separation—checks local weakness.

2 PLY-LOCK—the new Goodrich way of *locking* the plies about the bead. Anchoring them in place. Positive protection against the short plies tearing loose above the bead.

3 100% FULL-FLOATING CORD—Each cord is surrounded by rubber. With ordinary cross-woven fabric, when the cords touch each other, they rub—get hot—break. In Silvertowns, there are no cross cords. No friction.

Goodrich *Triple Protected* Silvertowns
FOR TRUCKS AND BUSES

Built to Stand the Gaff on the Toughest Kind of Jobs



A McCormick-Deering T-40 TracTracTor powered by a Diesel engine pulling a revolving scraper on a new section of the Long Lake-Manchester Highway near Seattle, Wash. This outfit is owned by R. Stone, contractor on this Federal project.

McCORMICK-DEERING INDUSTRIAL TRACTORS have long been identified with the construction industry—they are pioneers in the development of the roads of the nation. They had to be good, they had to have the stuff, to be able to stay in this business. They are the choice of road builders and contractors because they have proved their performance, their efficiency, their economy. They are backed up in their work by unusual after-sale service. The McCormick-Deering Industrial Power line includes four sizes of wheel tractors; two sizes of crawler tractors, one of which is available with gasoline or Diesel engine; and three power units, including one with a Diesel engine.

Get in touch with the nearest International Harvester branch, or with any McCormick-Deering distributor or dealer, for prices, specifications, and other detailed information.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. *of* America (*Incorporated*) Chicago, Illinois

Above: Three McCormick-Deering-powered maintainers keep this road in good condition.

A McCormick-Deering-powered shovel handling dirt on a sewer project in Chicago.

McCORMICK-DEERING INDUSTRIAL POWER

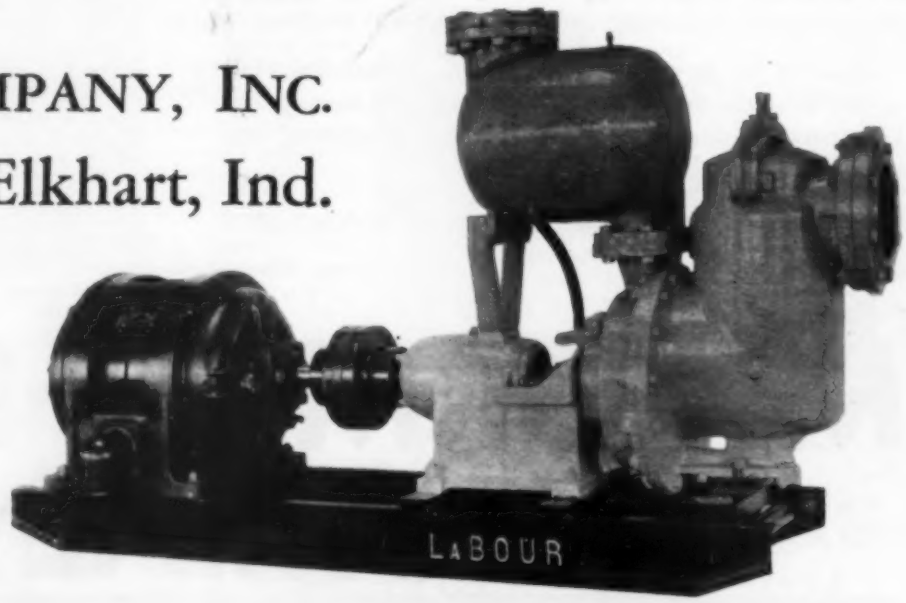
LA BOUR PUMPS
Handling 936 Well points

John W. Griffiths & Son Co. of Chicago, contractors on the Mississippi River Lock and Dam project at Alton, Illinois, are using 17 No. 60 LaBour pumps, connected to 936 well points, to keep the working area dry. Each of these pumps has a capacity of 1500 G.P.M. at full suction lift. Only 9 of the 17 pumps on the project show in the photograph reproduced above.

It is significant that LaBour Self-Priming Centrifugals were entrusted with the responsibility for this gigantic job. The Griffiths Company has long been a user of LaBour pumps, and they know the staunch dependability, the honest capacity, the trouble-free simplicity, of the pumps they selected to keep "Ole Man Ribber" out of the way.

On jobs like this one, where the equipment has got to deliver and no excuses count, you're sure to find LaBours doing their stuff. We'll be glad to send you details about the exclusive principle which makes LaBour Self-Priming Centrifugal Pumps the inevitable choice of engineers who are up against the real thing. You'll save time, trouble and money by using LaBours on *your* jobs.

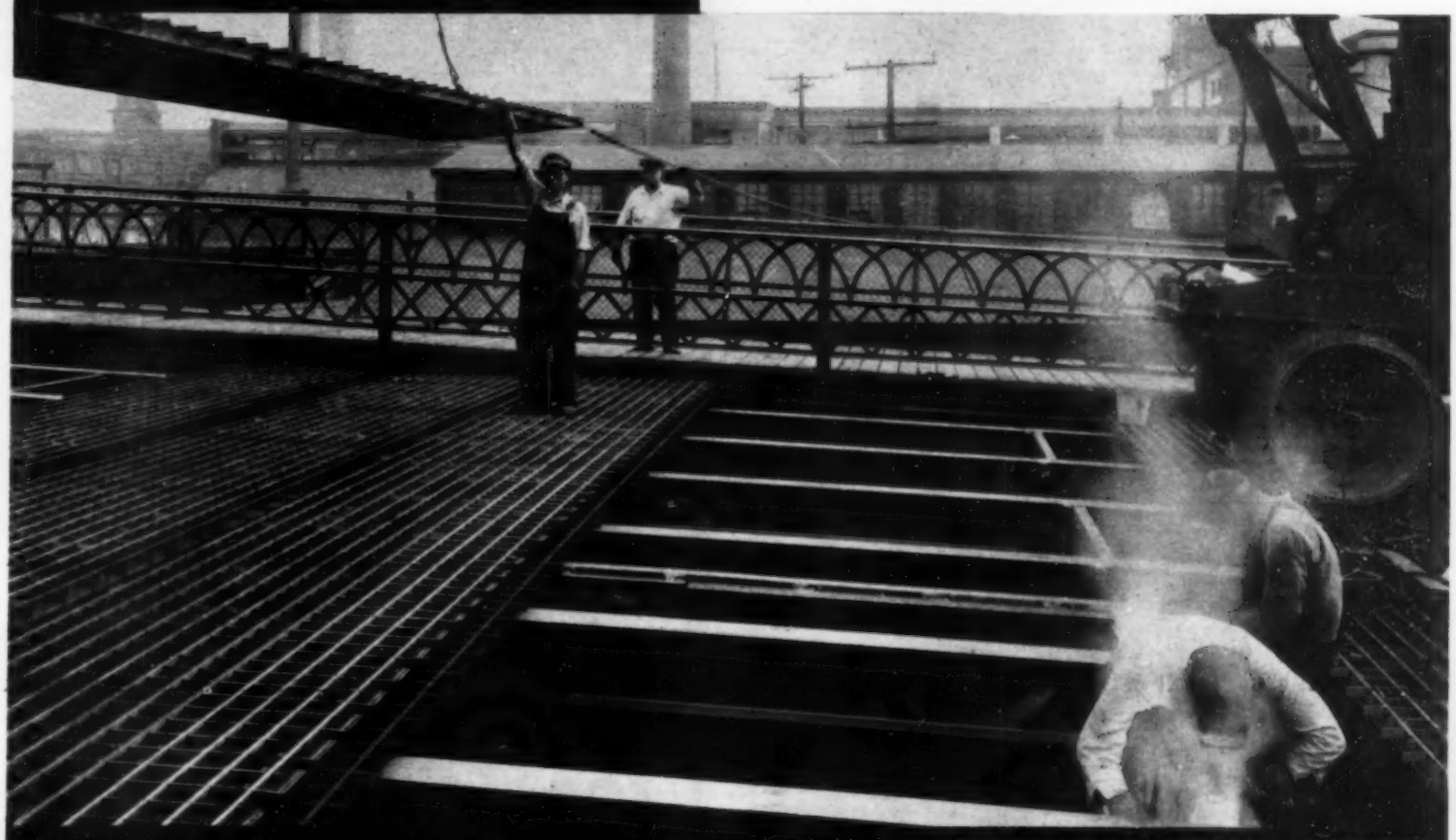
THE LABOUR COMPANY, INC.
1109 Sterling Ave., Elkhart, Ind.



Here is one of the No. 60 LaBour Pumps like the 17 referred to above. It is electric driven, with 8" suction and 6" discharge, and pumps 1500 G.P.M. The LaBour line includes portable and skid-mounted pumps down to 1" size, for electric, gasoline, steam turbine or belt drive. Bulletin 41, sent free for the asking, describes these pumps.

Ready for the concrete.
West approach ramp.

TOMORROW'S BRIDGE *To-day!*



Installing standard I-Beam-Lok units. Note heavy truck crane riding directly on unfilled units.

I·BEAM·LOK *Armored*

BRIDGE ROADWAY SLABS AND HEAVY DUTY FLOORS

Over the railroad tracks form strips were omitted. Wood forms were placed ¾" below I-Beam-Lok units to provide smooth concrete under-surface.

25,000 square feet of I-Beam-Lok—the first installation of this new, light, strong bridge flooring—was successfully used in re-flooring the East Grand Boulevard Viaduct over the Grand Trunk Railway lines, Detroit. The work was divided into two contracts. The city portion included two sloping approach ramps 40′ wide, and the railroad portion over the tracks, two level roadways totaling 40′ in width. • I-Beam-Lok is particularly suitable for such reflooring jobs. In many cases no modification in the structure is necessary. In new work, the reduced dead load of I-Beam-Lok permits substantial savings in the cost of the entire structure. • Send for our new booklet, or better still, let our engineers discuss this truly important development with you.

TAYLOR & GASKIN, *Contractors, city portion.*
WILLIAM E. LENNANE, *Contractor, railroad portion.*

US STEEL

CARNEGIE
STEEL COMPANY
PITTSBURGH, PA.

Subsidiary of United States Steel Corporation 292

Baker Bulldozers used by Hendrickson Bros., Contractors, Valley Stream, N. Y. on road project between East Moriches and Riverhead, L. I.

HIGH LIFT *and* ACCURATE BLADE CONTROL *mean* MORE PROFIT

Just as hundreds of other contractors have discovered, Hendrickson Bros. have found in the Baker, a Bulldozer that meets all situations. High blade lift gives ample clearance on steep inclines. Perfect control of the blade at all times, using a single control lever, makes it possible to cut to exact grades. There is dollars-and-cents value in these features in getting better grades, speeding up the job and cutting down excessive labor costs.

Not only on road work but on all kinds of grading jobs, contractors have swung to Baker Bulldozers. There are many other features, each one a reason for putting Bakers on the job. Send for interesting booklet on Bulldozers today.

THE BAKER MANUFACTURING CO.

568 Stanford Avenue — Springfield, Illinois

BAKER BULLDOZERS BAKER

BARBER-GREENE CONVEYOR CARRIERS

Barber-Greene carriers are backed by perfect records in almost every field of industry, in the handling of almost every conceivable material, and under extremely severe conditions. These carriers are made in three types: Roller bearing, ball bearing, and plain bearing, putting Barber-Greene quality of design and workmanship within reach of every one who has material to handle.

Standarized Material Handling Machines

BARBER GREENE

We have just published a new bulletin devoted exclusively to B-G carriers, showing all types, and giving complete specifications. This bulletin is yours for the asking. Just write for bulletin C-1. There is no obligation.

530 W. Park Ave. Aurora, Illinois

Write today for *your copy of the NEW* GOODALL

CATALOG No. 26

A catalog designed to be of real service "on the job" to superintendents, engineers, master mechanics.

In addition to illustrating and describing the usual and unusual in hose, belting and packing for the service conditions on construction projects there is a section devoted to "Technical Data", tables of hose deliveries, pressures, temperatures, weights, areas and formulas on conveyor and transmission belting installations make this section of great value and convenience.

Drop a line for your copy NOW.

GOODALL RUBBER CO.

9 South 36th Street — Philadelphia, Pa.

BETTER WINTER CONCRETE

WINTER concreting is now entirely practical. Concrete placed and cured at a temperature of 40° F., attains *a strength of* 2000 *lbs. per square inch in five days* when two pounds of Calcium Chloride per sack of cement is incorporated in the mix.

As shown by the chart, Calcium Chloride shortens by ONE-HALF the time required to gain 2000-pound strength with plain concrete.

These results are confirmed by the statement of the Bureau of Standards in a report presented to the Highway Research Board: "Concretes with all percentages of Calcium Chloride (0% to 3%) show increased strength over plain concrete at all ages tested."

This accelerated development of early-strength concrete reduces the time during which special protection is required when concrete is placed below freezing temperatures. The use of Calcium Chloride thus makes winter concreting entirely—*and economically*—practicable. It insures *proper curing* as well.

Thus does Calcium Chloride concrete curing help to keep labor employed and contractors' equipment in use the year round. For complete, free information on cold-weather concreting, write to any of the following members of the

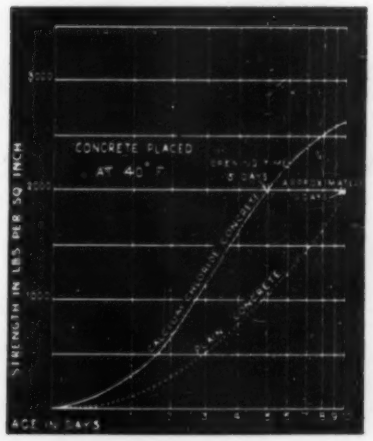
CALCIUM CHLORIDE ASSOCIATION

THE COLUMBIA ALKALI CORP.
Barberton, Ohio

SOLVAY SALES CORPORATION
61 Broadway, New York City

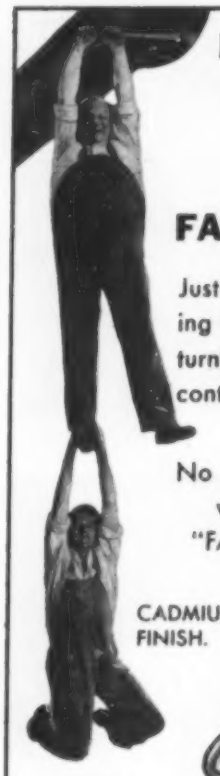
THE DOW CHEMICAL COMPANY
Midland, Michigan

MICHIGAN ALKALI COMPANY
60 E. 42nd St., New York City



CALCIUM CHLORIDE

FOR MODERN CONCRETE CURING



A STRONGER AND BETTER WRENCH IN EVERY WAY

THE NEW MODEL

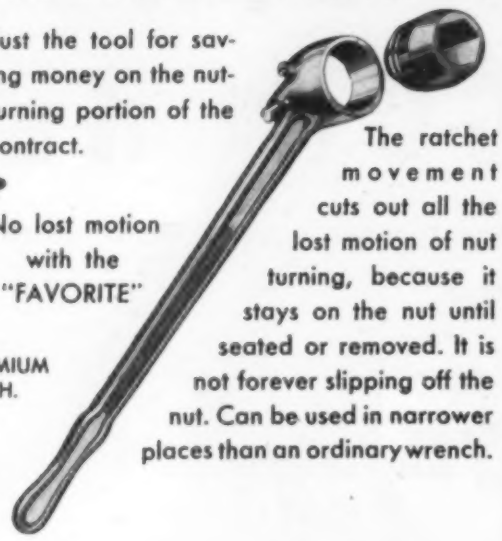
of the

FAVORITE reversible ratchet WRENCH

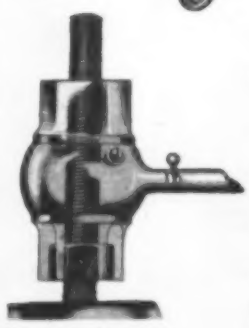
Just the tool for saving money on the nut-turning portion of the contract.

No lost motion with the "FAVORITE"

CADMIUM FINISH.



The ratchet movement cuts out all the lost motion of nut turning, because it stays on the nut until seated or removed. It is not forever slipping off the nut. Can be used in narrower places than an ordinary wrench.



Opening in head allows bolt to pass clear through.

Why the "Favorite" is a better wrench than it was:

Made of stronger metal.

Parts reinforced.

More accurate nut fit.

Sizes regrouped to avoid duplications and awkward combinations.

Send for full particulars.

GREENE, TWEED & CO.

Sole Manufacturers

109 Duane St.

New York

It is so simple and it will save you so MUCH MONEY to know your cable loads

Money saved when they are right, money wasted when they are wrong.

You can check the load on any line on the Job with a Martin-Decker, Shunt Type Tension Indicator, quickly and accurately, without dead-ending or cutting.

Two sizes—for cables ¼" to 2⅜" in diameter; loads up to 260,000 pounds.

Write for descriptive literature

MARTIN-DECKER CORPORATION

3431 Cherry Avenue, Box 249 Long Beach, Calif.

U. S. A.

NATIONAL CARBIDE

V-G LIGHTS

Most Light from least Carbide Quickly Charged

Easily moved—No wires

No Burner Troubles

No waste Carbide whether used continuously or intermittently

No harm done if tipped over

Extension to X-100 DOUBLES THE CANDLE POWER *fastens anywhere*

Always use NATIONAL CARBIDE *"In the Red Drum"* Distributors Coast to Coast

WRITE FOR COMPLETE INFORMATION

X-100
NATIONAL CARBIDE V-G LIGHT

About 8,000 c.p. for 12 hours on 7 lb. charge of National Carbide. Easily handled by one man. Weight 35 lbs. empty; 98 lbs. full.

Y199
NATIONAL CARBIDE V-G HANDY LIGHT

Burns about 5½ hours on 1¾ lbs. of 14-ND Carbide, 2 gals. water; delivers about 1500 c.p. Weighs 37 lbs. charged—easy to carry, handy in emergencies.

WL1-C1
NATIONAL CARBIDE LANTERN

Burns 8 hrs. on 8 oz. of Carbide. Brilliant rear signal of red, blue or green, no extra charge . . . Ideal for emergency lighting on road at night.

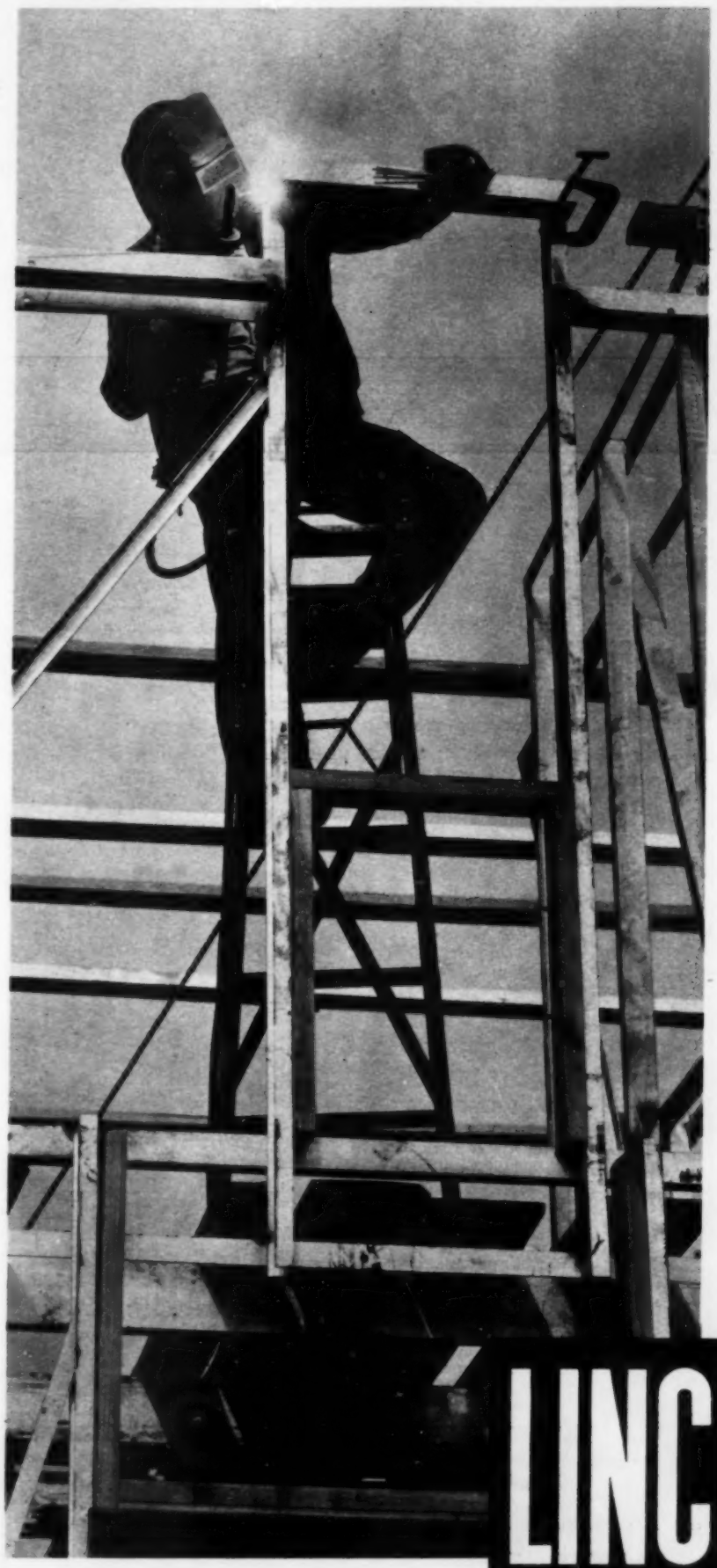
NATIONAL CARBIDE SALES CORP.

LINCOLN BUILDING

Opposite Grand Central, NEW YORK

"Shield-Arc"

ALLOWS YOU TO GET THE MOST OUT OF



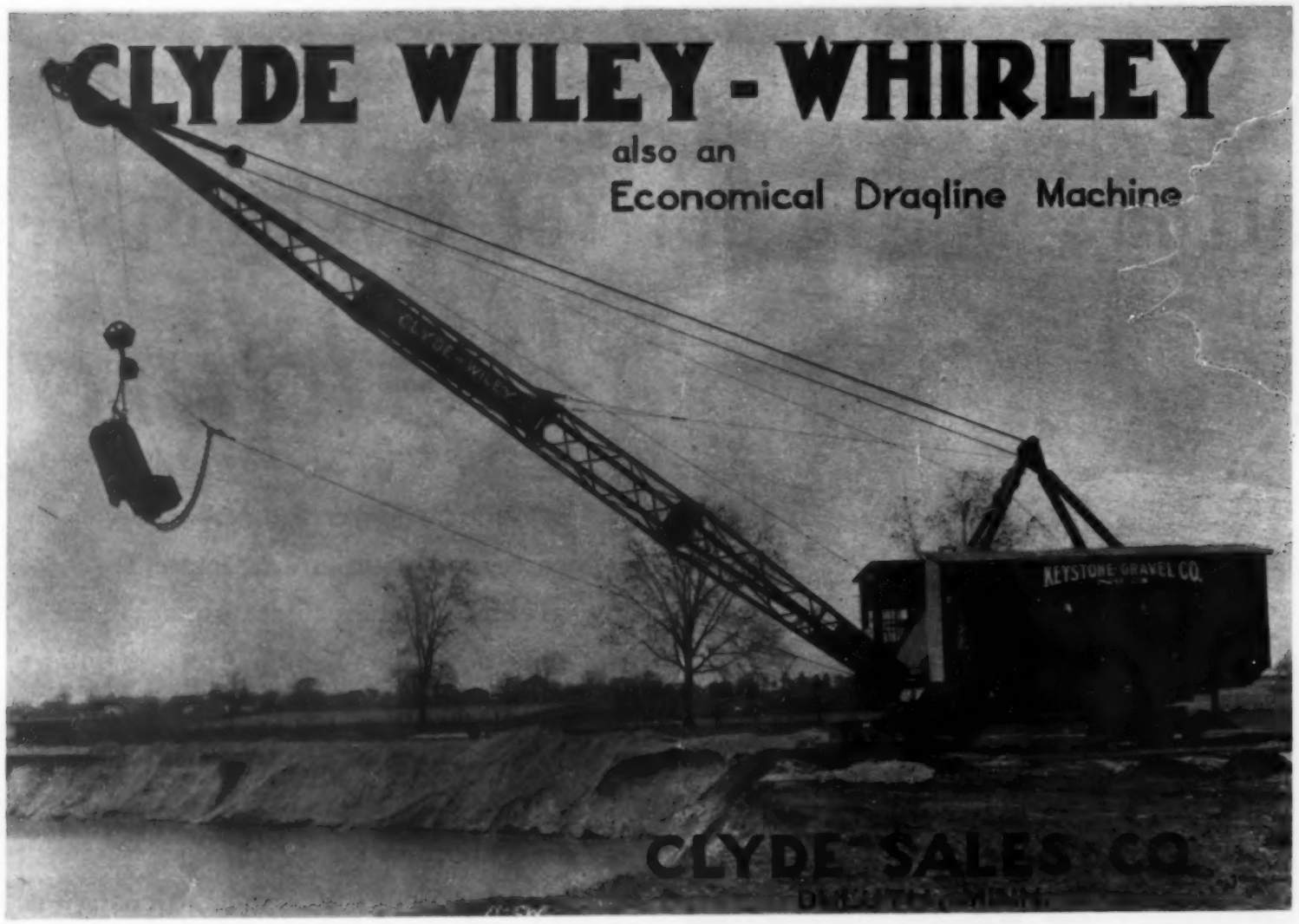
Welding

• What a lot *"Shield-Arc"* welding can give you in any structure. It allows greater freedom in design, saves steel, cuts down dead load. And it's quiet—which keeps the neighbors to the job happy. Don't be satisfied with all these advantages, because *"Shield-Arc"* still has another big feature in its favor—and in your favor, too...it costs less.

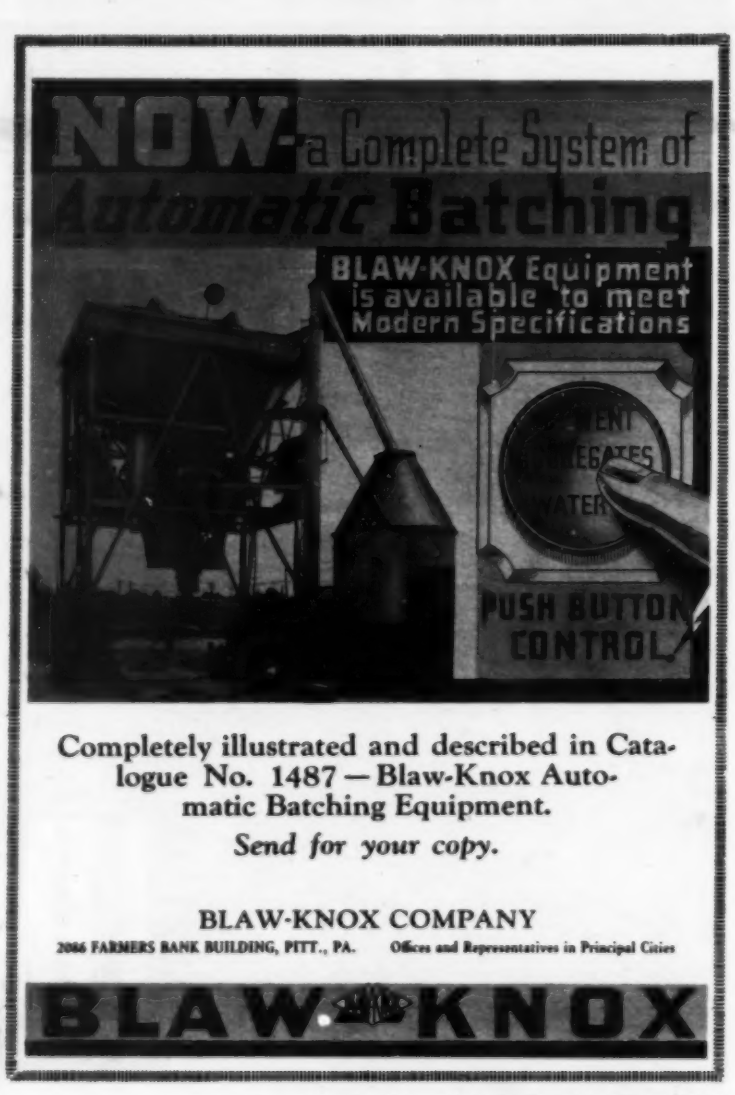
"Shield-Arc" gives more weld per dollar. That's why more Lincoln welders are used by contractors than any other make... and why many have found it more economical to scrap their old type machines for *"Shield-Arcs."* The savings made by the *"Shield-Arc"* soon put back into your pocket its cost. Find out now how much *"Shield-Arc"* welding can save you, address the Lincoln Electric Company, Cleveland, Ohio. Largest manufacturers of arc welding equipment in the world.

W-83

LINCOLN "SHIELD-ARC" WELDERS


CLYDE WILEY-WHIRLEY
also an
Economical Draqline Machine
KEYSTONE GRAVEL CO.
CLYDE SALES CO.

this size
ROD or BOLT
PORTER HKP
portable two hand
CUTTING TOOLS
Cut a bolt as large as the one pictured above — any where on the job. Cut rods, cable or flat stock in one operation — in the fraction of a minute — with the Porter tool designed for this purpose. Cut stay rods and tie wire in concrete work — heavy nails and bolts in forms and scaffolding — all sorts of rods, heavy wire, chain, etc. in wrecking work, maintenance repairs, production, etc. There is a Porter tool for every requirement — special models for special needs.
Write for catalog.
Ask your supply house or jobber.
20" LONG
No. 2
CUTS
½" BOLTS
OR
⅝" RODS
H. K. PORTER, INC. Everett, Mass.


NOW- a Complete System of
Automatic Batching
BLAW-KNOX Equipment
is available to meet
Modern Specifications
PUSH BUTTON
CONTROL
Completely illustrated and described in Catalogue No. 1487 — Blaw-Knox Automatic Batching Equipment.
Send for your copy.
BLAW-KNOX COMPANY
2086 FARMERS BANK BUILDING, PITT., PA. Offices and Representatives in Principal Cities
BLAW-KNOX

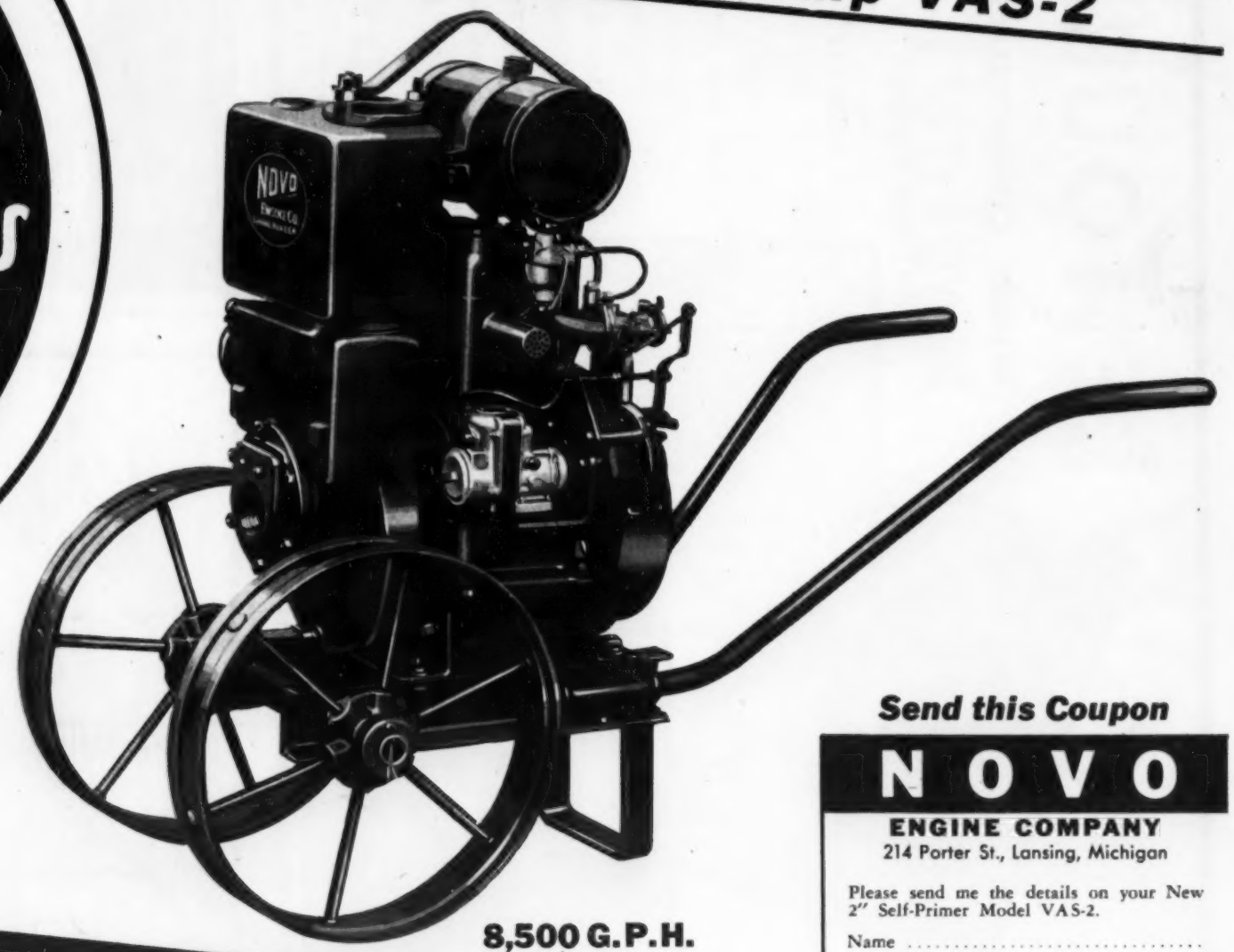
NOVO ANNOUNCES

The New 2 in. Self-Priming Centrifugal Pump VAS-2

$115 ON SKIDS

$125 ON WHEELS

2½ H.P.



8,500 G.P.H.

Here is an Honest to Goodness 2" Pump—not a 1½" with a Plug Hat (2" fittings).

It has a full 2½ H.P. water cooled engine.

Exclusive leather seal—requires no attention.

There is a complete line of Injecto-Prime Self-Priming Centrifugal Pumps 2"—3"—4"—6".

Send the Coupon for Full Information.

Send this Coupon

NOVO

ENGINE COMPANY

214 Porter St., Lansing, Michigan

Please send me the details on your New 2" Self-Primer Model VAS-2.

Name .....

Address .....

LE TOURNEAU

WHERE CONDITIONS ARE BAD

Photos: Top; Angledozer in Plumas County, California, pioneering road in rock. Above; 25-Yard Buggy in heavy gumbo on a Mississippi River Levee contract. Left; Excavating in Glacier National Park.

Le Tourneaus will move your excavation at a profit

When winter comes, Le Tourneau Equipment does not fail. Tough jobs — rock — mud — water — snow — will not stop this modern machinery • Built for all-year-'round use — built to give you service — to produce — to handle your excavation in the shortest possible time at the lowest possible cost per yard.

Write for descriptive literature

R. G. LE TOURNEAU, INC.
Stockton **California**

This new car mover is light in weight, 16 lbs., yet is powerful and rugged. The pressure is scientifically triangulated to throw entire weight on spurs which are so placed as to grip the corners of the rail . . . not a chance of slipping.

This mover will get under the load and place the handle high, enabling the operator to use full strength safely in starting the car.

Mover "ratchets" easily once the car is started and the angle of spurs prevents any chance of mover leaving the rail accidentally.

SPECIFICATIONS

Handle—Selected white hickory, 56½ in. long, waxed finish. Spurs—Special heat treated alloy steel with four sharp edges placed at extreme angle to grip the corners of the rail rather than the hard glazed top surface.

SAFETY WRENCH & APPLIANCE COMPANY
52 Commercial St. Worcester, Mass.

Section of Pennsylvania Railroad Tunnel Under the East River, New York City, being waterproofed with—

Sika

Use Sika to stop the inflow of water through dams, walls of pump houses, man-holes, filter beds, sewage tunnels, etc. Sika mixed with portland cement is easily applied by hand and will successfully seal off infiltration from underground streams even under pressure.

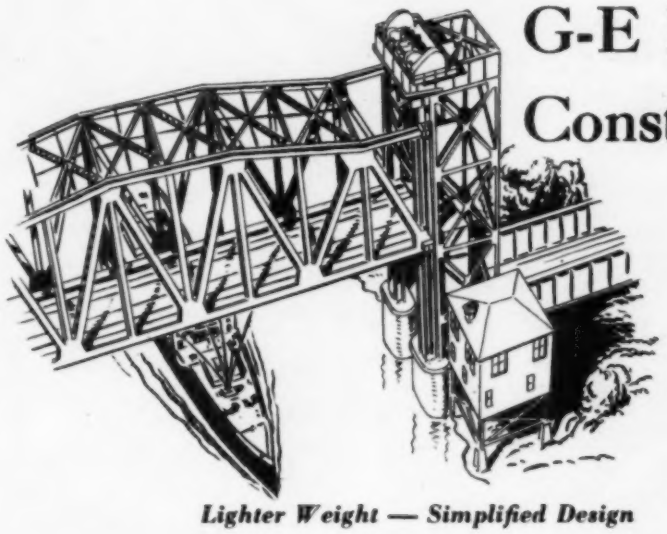
Write us about your problems.

Sika, Inc.

1943 Grand Central Terminal, New York City

Here's NEWS
on Lift-Bridge Construction

G-E Power Selsyn Drives* Reduce Construction Costs, Save on Upkeep



Lighter Weight — Simplified Design

The weight and cost of the lift span are reduced by using the G-E power Selsyn drive for lift bridges — the motors are mounted on the towers instead of on the lift span.

A further saving in over-all construction costs is provided by this new-type drive because it eliminates much of the complicated mechanism, such as up-haul and down-haul cables and sheaves, which is required by conventional-type drives. The G-E power Selsyn drive requires only comparatively short cables and one set of sheaves on each tower.

Lower Maintenance

Simplification of the lifting mechanism also materially reduces the cost of bridge maintenance. Much expensive, frequent cable-greasing is eliminated. With the G-E power Selsyn drive there are no back bends; cable lasts longer, and is replaced at much less expense than the longer, heavier cable used with conventional drives. These are regular periodic savings that will benefit the bridge owner time and time again.

Dependable — Safe

The G-E power Selsyn drive is dependable and safe. Accurate synchronization of the two separate driving mechanisms atop the towers is assured by the power Selsyn principle. The bridge level is automatically maintained during all stages of operation, and skew is reduced to the vanishing point.

Easy Operation

The G-E control panel and control desk in the bridge house make operation simple and easy. Duplicate motors for driving and synchronizing provide maximum flexibility for emergency operation. General Electric Company, Schenectady, N. Y.

* A power Selsyn drive consists of two wound-rotor induction motors so connected electrically that they operate in exact synchronism, as though connected mechanically.

020-97

GENERAL ELECTRIC

U. S. DAM # FIVE

Showing the third and last cofferdam.

WITH a head of twenty to thirty feet of water to work against, a MORETRENCH WELLPOINT SYSTEM quietly absorbed and expelled all seepage water giving the contractor a dry subgrade to work on. He cut his sheeting expenses by using sand dams on the sides of the first cofferdam, and also for a temporary cross dam in deeper water on the second. He used a single line of steel on the outsides of the second and third. His bold innovations were made with entire safety.

THE MORETRENCH WELLPOINT SYSTEM makes every job a dry job. And the final pumping cost is half or less that of any other method.

MORETRENCH CORPORATION

Works:
Rockaway, New Jersey

Sales Office:
90 West Street, New York City

Construction Methods Service Section

AMERICAN
(ALL STEEL)
PILE SHOES
Modern, Efficient, Economical
Save cost in Piles
For Wood Piles
Special Designs For Concrete Piles
Write for Particulars
THE AMERICAN PULLEY COMPANY
4202 Wissahickon Avenue Philadelphia

"ACME" ROAD MACHINERY
Heavy Duty — Larger Capacity — Longer Life —
Try a new Acme Reduction Crusher or a new Acme H. D. Roller Screen on your new job.
For Satisfaction and Service use Genuine "ACME" Parts. Communicate with nearest Dealer, main office—*Frankfort, N. Y. or 120 Liberty St., New York City.*

1934
A Record for Service to Contractors

In 1935 more State Highway Departments will include FLEX-PLANE Mechanical Contraction Joints in their specifications and soon they will be universally used—thereby, reducing cost and building better concrete roads.
FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO

We Break Concrete by Machine or Blasting
Roads
Trenches
Walls — Piers
Buildings
Bridges
Foundations

This machine is the fastest and most powerful known, for work of this nature. Let us estimate on your job.
Concrete Cutting Corp. of America
52 Clark Street Brooklyn, N. Y.

HEAVY DUTY TRAILERS
5 to 100 Tons Capacity
Rogers Heavy Duty Trailers—standard 5 to 50 tons capacity—special up to 100 tons—4, 6, 8 and 12 wheel type. Gooseneck front permits short turn. Easily loaded—stand the gaff. *Write.*

ROGERS
BROS. CORP. ALBION, PA.

FIVE TON HANDY HOIST

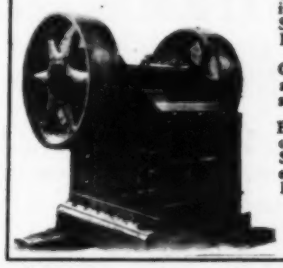
A compact unit weighing 125 lb.
All Steel Construction, Capacity Five Tons.
Internal Brake. Size 16 x 20 x 13 in.
Price $75.00
F. O. B. Factory
Alloy Steel & Metals Co., Inc.
1862 East 55th St. Los Angeles, Calif.

A SIMPLE FACT, EASILY OVERLOOKED

Among the 20,000 and more readers of Construction Methods, *other* men who glance at this section, *as you are doing*, are *also* interested in anything that has a part in efficient and economical construction operations. How logical, then, to convey information of appropriate construction equipment, accessories and other products used in construction—to these men—through advertising right here on this page—*a simple fact, easily overlooked.*

FOR FULL INFORMATION ADDRESS
Departmental Advertising Staff
CONSTRUCTION METHODS
330 West 42nd St. N. Y. C.

GOOD ROADS PRODUCTS ***CHAMPION***



Rock Crushers • Bucket Elevators • Revolving Screens • Vibrating Screens • Sand Wash Boxes • Feeders.
Complete Rock and Sand and Gravel Plants designed and engineered.
Bituminuous Distributors. Sand and Chip Spreaders. Road Graders and Drags. Snow Plows. Tar Kettles.
GOOD ROADS MACHINERY CO.
Kennett Square, Pa.

• HYDRAUGER •
MODERN HORIZONTAL BORING MACHINE
For Underground Installation of Pipe and Conduits. Avoids damage to costly pavements and saves time. Send for Bulletin.
HYDRAUGER CORPORATION, LTD.
343 Sansome Street • San Francisco, California

NOTICE TO ROAD CONTRACTORS
Aluminum, Steel, and Master Straight Edges; Edging Tools; Finishing Bridges; Longitudinal Floats; Scratch Templates; Concrete Strike-offs; and other special Road Builders Tools. Meet all State Highway Specifications.
Get them from
THE CLEVELAND FORMGRADER COMPANY
W. 116th St. and N.K.P.R.R. Cleveland, Ohio

"RIVET-BOLT"
(TRADE MARK REGISTERED)
A Stronger, Cheaper, Quieter Fastening for All Steel Construction. Write for Bulletin 11.
Deliveries from Stock
DARDELET THREADLOCK CORPORATION
120 Broadway New York City

To MANUFACTURERS
This space costs 37½ cents per thousand readers. A trifling sum compared to the service it can render in contacting possible buyers of your products.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF MARCH 3, 1933 Of Construction Methods, published monthly at New York, N. Y. for Oct. 1, 1934.

State of New York) ss.
County of New York)

Before me, a Notary Public in and for the State and county aforesaid, personally appeared R. R. Putnam, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Construction Methods, and, that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, N.Y.C. Editor, Robert K. Tomlin, 330 West 42nd Street, N.Y.C. Managing Editor, none. Business Manager, William Buxman, 330 West 42nd Street, N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N.Y.C. Stockholders of which are: James H. McGraw, 330 West 42nd St., N.Y.C. James H. McGraw, Jr., 330 West 42nd St., N.Y.C. James H. McGraw, James H. McGraw, Jr., and Malcolm Muir, 330 West 42nd St., N.Y.C., Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw. Curtis W. McGraw, 330 West 42nd St., N.Y.C. Donald C. McGraw, 330 West 42nd St., N.Y.C. Anne Hugus Britton, 330 West 42nd St., N.Y.C. Mason Britton, 330 West 42nd St., N.Y.C. Edgar Kobak, 330 West 42nd St., N.Y.C. Grace W. Mehren, 33 West Grand Ave., Chicago, Ill. J. Malcolm Muir and Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 524 Fifth Ave., N.Y.C. F. S. Weatherby, 271 Clinton Road, Brookline, Mass. Midwood Corporation, Madison, N. J. Stockholders of which are: Edwin S. Wilsey, Madison, N. J. Elsa M. Wilsey, Madison, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the months preceding the date shown above is. (This information is required from daily publications only.)

R. R. Putnam, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 28th day of September, 1934.

(SEAL) H. E. BEIRNE,
Notary Public, Nassau County. Clerk's No. 66 N. Y. Clerk's No. 113. Reg. No. 6-B-73

(My commission expires March 30, 1936)

BUCYRUS-ERIE "Red Arch"
DRAGLINE BUCKETS
Faster digging · longer service · lower costs and surer profits from your dragline with one of these light, sturdy, quick-filling, easy-dumping "Red Arch" Buckets · ⅜ to 12 yards · Investigate
BUCYRUS ERIE
BUCYRUS-ERIE CO., South Milwaukee, Wis.

Need INFORMATION?

Any time you need information on equipment or material for which you are in the market—and which you do not find featured in the advertising pages of Construction Methods—by all means let us know.

Our information department will be glad to assist you in securing any information you require, at any time.

Simply address

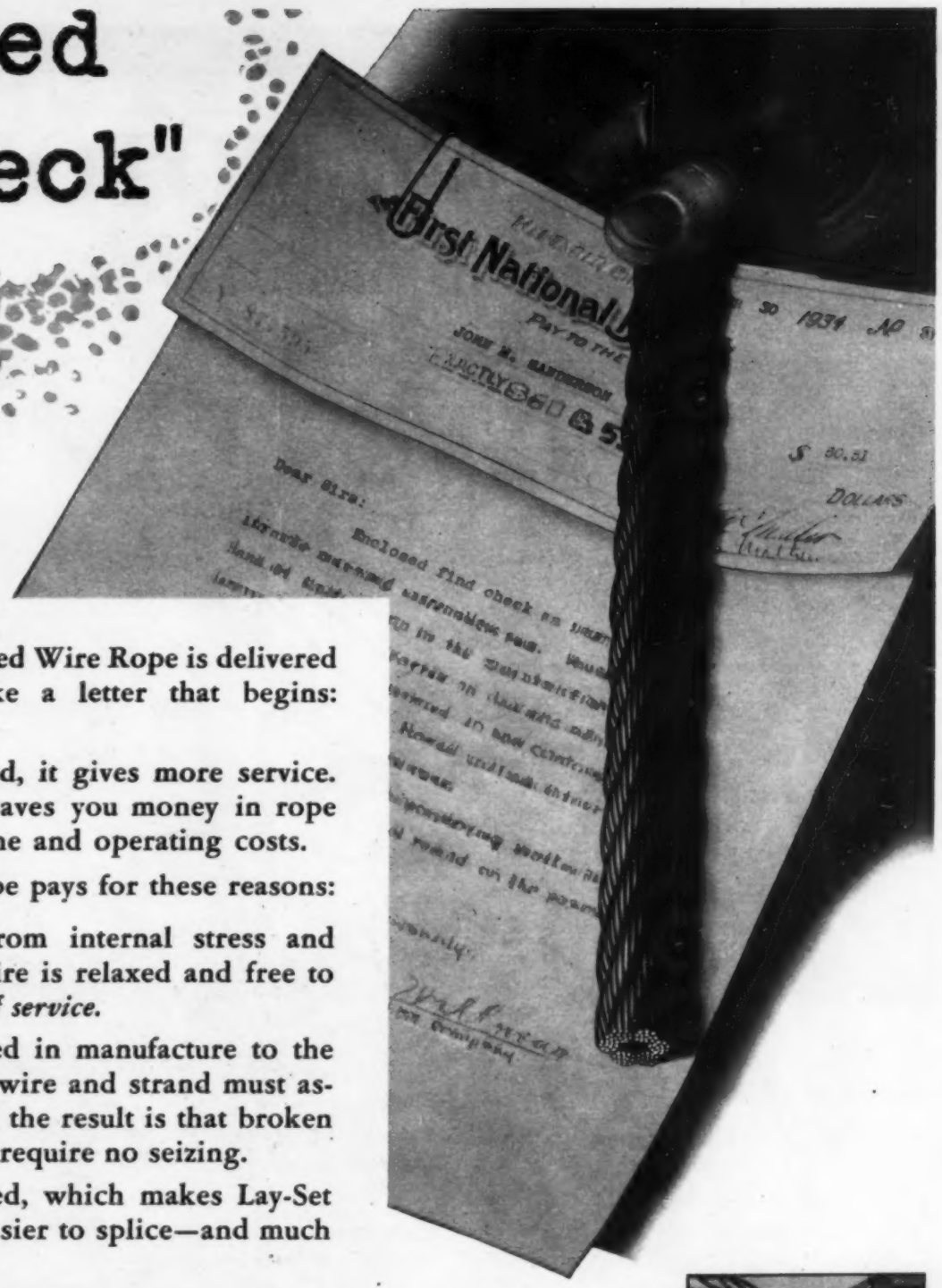
CONSTRUCTION METHODS
Information Bureau
330 West 42nd Street, New York, N. Y.

CONSTRUCTION METHODS ADVERTISERS IN THIS ISSUE

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Construction Methods* assumes no responsibility for errors or omissions.

Acme Road Mchy. Co. 69
Adnun Engr. & Mfg. Co. 20
Allis-Chalmers Mfg. Co. .. Center Spread
Alloy Steel & Metals Co. 69
American Cable Co. 15
American Pulley Co. 69
Armco Culvert Mfgr's Assn. ....4th Cover
Austin-Western Road Mchy. Co. 11
Baker Mfg. Co. 60
Barber-Greene Co. 60
Barco Mfg. Company 16
Barrett Company 12
Blaw-Knox Company 64
Bucyrus-Erie Co. 17-70
Calcium Chloride Ass'n 61
Carnegie Steel Co. 59
Caterpillar Tractor Co. 6
Cleveland Formgrader Co. 69
Clyde Sales Co. 64
Columbia Alkali Corp. 61
Concrete Cutting Corp. of America... 69
Dardelet Threadlock Corp. 69
Dow Chemical Co. 61
Du Pont de Nemours Co., Inc., E. I... 8
Ensign-Bickford Co. 18
Euclid Road Mchry. Co. 5
Flexible Road Joint Machine Co. 69
Foote Co., Inc. 20
General Electric Co. 67
Goodall Rubber Co. 60
Goodrich Co., B. F. 56
Good Roads Mchry. Co. 69
Greene Tweed & Co. 62
Hazard Wire Rope Co. .....3rd Cover
Hydrauger Corp., Ltd. 69
Illinois Steel Company 14
Inland Steel Co. 55
International Cement Corp. 7
International Harvester Co. 57
Jaeger Machine Co. 53
Kalman Steel Corp. 10
Koehring Company 21
La Bour Company 58
Le Tourneau, R. G. 66
Lincoln Electric Co. 63
Link-Belt Company .....2nd Cover
Martin Decker Corp. 62
Michigan Alkali Co. 61
Moretrench Corp. 68
National Carbide Sales Corp. 62
Northwest Engineering Co. 9
Novo Engine Company 65
Ohio Power Shovel Co. 13
Porter, Inc., H. K. 64
Reo Motor Car Co. 54
Rogers Bros. Corp. 69
Safety Wrench Appliance Co. 66
Service Section 69
Sika, Inc. 66
Solvay Sales Corp. 61
United States Pipe & Foundry Co. 19
U. S. Steel Corp. Subsidiaries. ...14-22-59
Universal Atlas Cement Co. 22

"Enclosed find check"



WHEN Lay-Set Preformed Wire Rope is delivered to your job it is like a letter that begins: "Enclosed find check."

Because Lay-Set is preformed, it gives more service. Because it lasts longer, it saves you money in rope replacement, in handling time and operating costs.

Lay-Set Preformed Wire Rope pays for these reasons:

1. Preforming frees it from internal stress and strain. Therefore each wire is relaxed and free to give you its *full measure of service.*

2. Having been preformed in manufacture to the exact helical shape every wire and strand must assume in the finished rope, the result is that broken wires lie flat and cut ends require no seizing.

3. It is completely relaxed, which makes Lay-Set much easier to handle—easier to splice—and much less likely to kink.

Send for a sample of Lay-Set Preformed Wire Rope. Take it apart and put it together again—it's fascinating, the way each strand cuddles into place. Examine it thoroughly and see for yourself why that sample is like a good bank check—why a reel of Lay-Set for your machinery would be, through money saving, like a letter which said: "Enclosed Find Check."

UNRETOUCHED PHOTO OF ORDINARY WIRE ROPE

UNRETOUCHED PHOTO OF LAY-SET PREFORMED WIRE ROPE

HAZARD WIRE ROPE COMPANY
Wilkes-Barre, Pennsylvania

New York Chicago Fort Worth San Francisco Philadelphia
Pittsburgh Denver Los Angeles Birmingham Tacoma

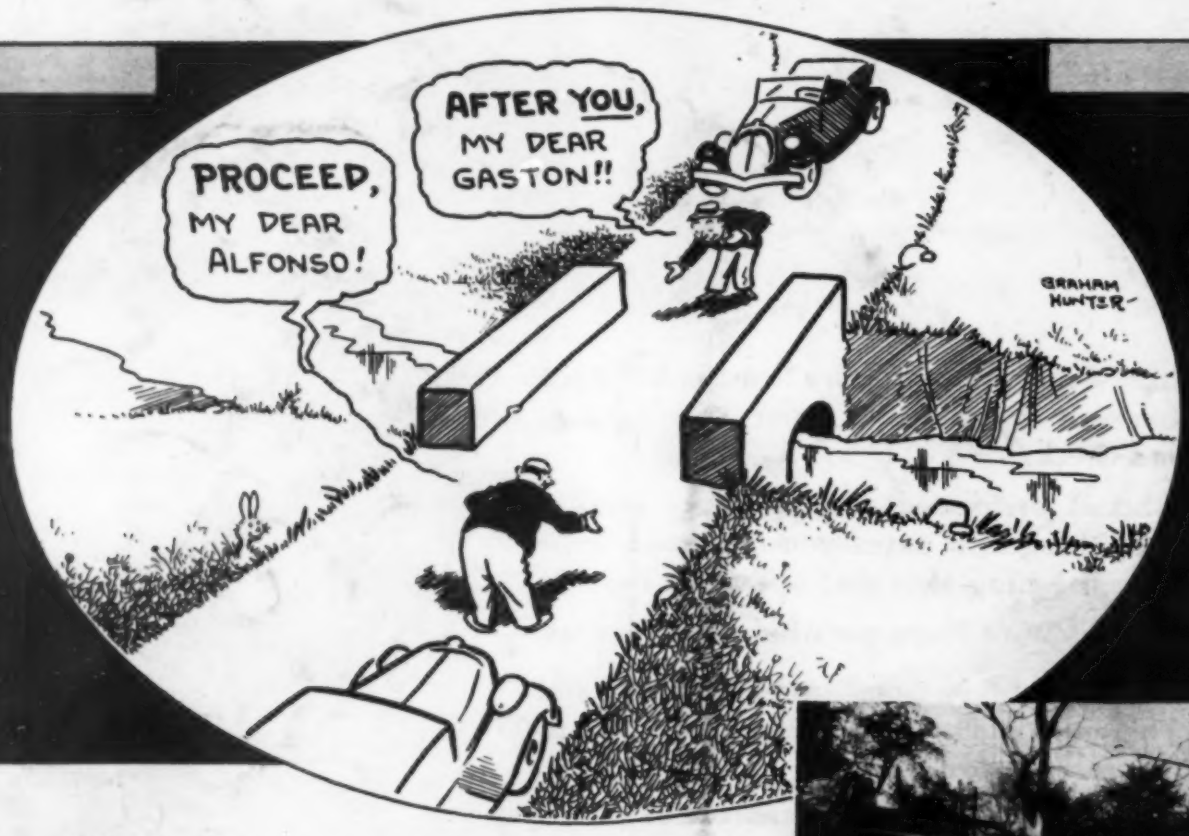
NRA CODE

LAY·SET *Preformed** Wire Rope

* PREFORMING IS A PATENTED MANUFACTURING PROCESS APPLICABLE TO ANY TYPE, GRADE, CONSTRUCTION AND LAY OF WIRE ROPE

Thousands of MOTORISTS

ENACT THIS DRAMA *EVERY DAY*



Sometimes It's Funny— Sometimes It's Tragic!

OF course, drivers don't actually get out of their cars and bow, when they meet on narrow bridges. But they frequently hesitate—wondering *who should cross first*. And if someone gets impatient—WHAM! Smash-up . . . injuries . . . damage suits!

Naturally, you don't want this to happen on *your* roads. And it need not happen. For you can widen nearly any type of bridge or culvert—quickly and economically—with Armco Multi Plate. It can generally be built the same shape as the old structure. Also, by "threading" it inside for a short distance, a strong, positive connection is assured.

Ask your Armco engineer about it, or mail the coupon.

Extending a narrow stone culvert in Warren County, Ohio, with a 10-foot span Armco Multi Plate Arch. (A lifetime structure.)

• ARMCO CULVERT MFRS. ASSOCIATION, Middletown, Ohio •

MULTI ARMCO PLATE

ARMCO MULTI PLATE

"FITS THE GROWING NEED FOR WIDER, SAFER ROADS"

☐ Send data on widening bridges and culverts with Armco Multi Plate.

Name .....

Title .....

Address .....

I am ☐ Engineer ☐ Official ☐ Contractor ☐ Student

CM-11-34